Examiners' Report
Lead Examiner Feedback

January 2022

Pearson BTEC Nationals
In Applied Human Biology (21325L)
Unit 1: Principles of Applied Human Biology

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Grade Boundaries

What is a grade boundary?

A grade boundary is where we set the level of achievement required to obtain a certain grade for the externally assessed unit. We set grade boundaries for each grade, at Distinction, Merit and Pass.

Setting grade boundaries

When we set grade boundaries, we look at the performance of every learner who took the external assessment. When we can see the full picture of performance, our experts are then able to decide where best to place the grade boundaries – this means that they decide what the lowest possible mark is for a particular grade.

When our experts set the grade boundaries, they make sure that learners receive grades which reflect their ability. Awarding grade boundaries is conducted to ensure learners achieve the grade they deserve to achieve, irrespective of variation in the external assessment.

Variations in external assessments

Each external assessment we set asks different questions and may assess different parts of the unit content outlined in the specification. It would be unfair to learners if we set the same grade boundaries for each assessment, because then it would not take accessibility into account.

Grade boundaries for this, and all other papers, are on the website via this link:
http://qualifications.pearson.com/en/support/support-topics/results-certification/grade-boundaries.html

Awarding BTEC qualifications in 2022

Ofqual has set out their plans for awarding qualifications in 2022 and intend to return to a normal, pre-pandemic, approach to grading standards over by 2023. They have confirmed that 2022 will be a transition year, to reflect that we are in a pandemic recovery period and students' education has been disrupted.

Our guiding principle and approach to awarding BTEC qualification results in 2022 will be to ensure parity in relation to the approach being taken for GCSE and A level learners. BTEC courses have a different structure and design to academic qualifications - BTECs are modular

qualifications (with assessments taking place throughout the course) compared to GCSEs and A levels which are linear (assessed and awarded at the same time at the end of the year), and therefore our approach needs to be different.

In 2022 we will return to the usual method of calculating BTEC qualification results, however adaptations including, U-TAGs and reduced internal assessment, are in place to provide a comprehensive package of support for students.

The basis of our awarding approach to BTECs this year is to ensure it is as fair as possible for all learners. We will use a range of evidence to set grade boundaries for the external units. Part of this evidence will be to closely monitor learner performance in all assessments that contribute to learners' final qualification grade, to ensure parity with A level and GCSEs.

Further information can be found on our website and via our Social Media channels.

21325L: Principles of Applied Human Biology

Grade	Unclassified	Level 3			
		N	P	M	D
Boundary Mark	**0**	**9**	**18**	**32**	**46**

Introduction to the Overall Performance of the Unit

This series we saw a broad spread of marks across the paper. There were some excellent answers given by learners across the paper indicating that in many cases there was an impressive degree of depth in learner understanding.

For this series in particular, it appeared that some learners struggled with the breadth of the specification as understanding of some topics was much more secure than others. Learners appeared to manage their time well in this examination with questions evenly answered throughout the paper.

Generally, learners performed best when given stimulus information to assess or data to interpret as part of their response – this could particularly be seen in the questions requiring the use of graphs and calculations as well as the extended open response question in which learners evaluated different treatment options for an immunodeficiency disorder.

In many cases learners reworded the content of the stem or the stimulus as their answer to a question. This is never worth credit unless accompanied by additional information or interpretation to demonstrate understanding of the topic. There are specific examples highlighted within the individual questions section of this report which illustrate this issue.

The more vocational aspects of the specification proved the most challenging for learners. It is vital that learners understand the purposes behind the various methods of monitoring and diagnostic testing covered by the specification so that they are able to effectively differentiate between the different tests available and provide sufficient detail when answering questions on the topic.

This series questions involving recall of key terminology and biological processes provided more of a challenge than has been seen previously – with cause and effect within these processes being particularly poorly understood. The topics of digestion and cell biology, including the different methods of transport across plasma membranes were ones where learners appeared to struggle.

Questions on the immunology section of the specification were much better answered than they have been previously, with learners showing a much stronger understanding of how the immune system functions. The questions on the genetics topics indicated that in general learners had a basic knowledge of the key concepts but in general, struggled to apply this to specific contexts within the questions.

Individual Questions

Question 1a

This question was not answered correctly by the majority of learners. Responses incorrectly giving names of other structures associated with the urinary system were relatively common. This is seen in the example below, awarded 0 marks:

1 One function of the kidney is to remove toxic substances from the blood.

Figure 1 shows the structure of a nephron in the kidney.

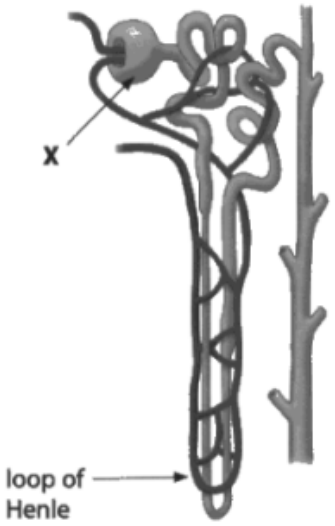

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Figure 1

(a) Name structure **X** in Figure 1.

(1)

Urethra.

It was also common for learners to repeat names of structures from the question stem and the diagram with “nephron” and “loop of Henle” seen frequently in learner responses.

An example of a correct learner response, scoring 1 mark, can be seen below:

1 One function of the kidney is to remove toxic substances from the blood.

Figure 1 shows the structure of a nephron in the kidney.

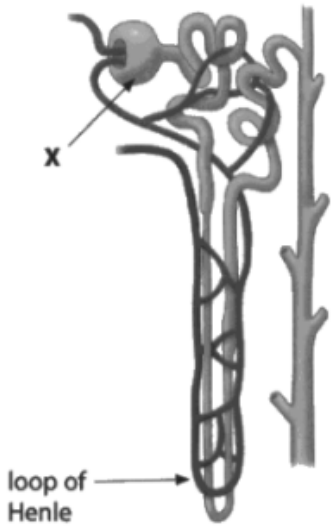

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Figure 1

(a) Name structure **X** in Figure 1.

(1)

Bowman's capsule.

It should be noted that learners did not need to capitalise "Bowman's", or include the possessive apostrophe, to be awarded the mark.

Question 1b

Over half of learners achieved at least one mark on this question.

Most learners identified either the large surface area or thin walls of the capillaries as an adaptation for 1 mark, but many were not able to go on and link this to a correct expansion point. Instead, we saw many responses making statements such as "helps absorption" which was not creditworthy as this was a repetition of the stem.

The following response was given 1 mark:

(b) A network of capillaries surrounds the nephron.

Explain how this adaptation allows substances to be absorbed back into the blood.

(2)

Capillaries have a large surface area which can help substances be wasted back into the blood

In this example the learner has correctly identified the large surface area but the expansion is too vague as it is simply a re wording of the question stem.

Learners scoring both marks for the question tended to answer in terms of thin walls with a link to decreased distance for diffusion. Correct expansions on the idea of a large surface area were relatively rare. The example below was given 2 marks:

(b) A network of capillaries surrounds the nephron.

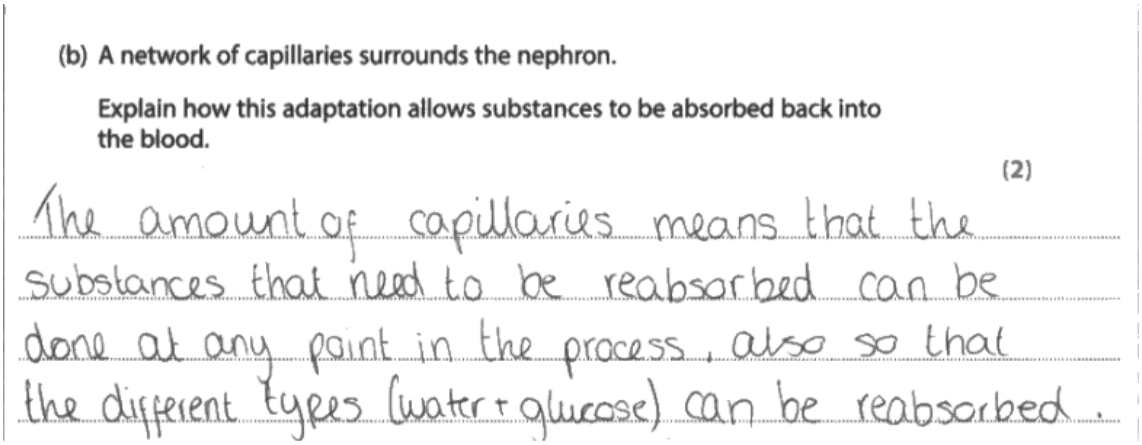
Explain how this adaptation allows substances to be absorbed back into the blood.

(2)

A network of capillaries has a large surface area, for more large scale diffusion. Capillaries are also one cell thick, which allows for shorter diffusion distance.

The learner has actually made both identification points – they have then gone on to correctly link the thin capillary walls (the language is slightly confused but the meaning is clear and so credit can be given) with a shorter diffusion distance and so they have been given the second mark.

Where the question was attempted but no marks could be given this was often because the answer was too vague in nature or did not answer the question in the correct context. An example of such a response can be seen below:



(b) A network of capillaries surrounds the nephron.

Explain how this adaptation allows substances to be absorbed back into the blood.

(2)

The amount of capillaries means that the substances that need to be reabsorbed can be done at any point in the process, also so that the different types (water + glucose) can be reabsorbed.

This response was given 0 marks – the learner has identified some substances that could be absorbed back into the blood but has not answered the question – the response is too generic to meet any of the marking points.

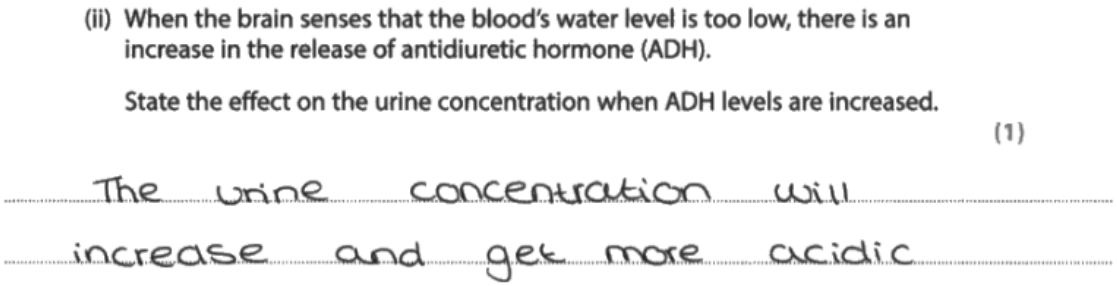
Question 1ci

This question was correctly answered by most learners with a majority able to identify osmosis as the process for water leaving the nephron.

Question 1cii

This question was well answered by most learners. Most correct answers were given in the expected format, although some learners phrased their responses in terms of the change to the amount of water present. While in many cases their meaning was clear in some learner responses this introduced some ambiguity due to confusion between concentration of water and concentration of urine.

An example of a correct response, awarded 1 mark, can be seen below



(ii) When the brain senses that the blood's water level is too low, there is an increase in the release of antidiuretic hormone (ADH).

State the effect on the urine concentration when ADH levels are increased.

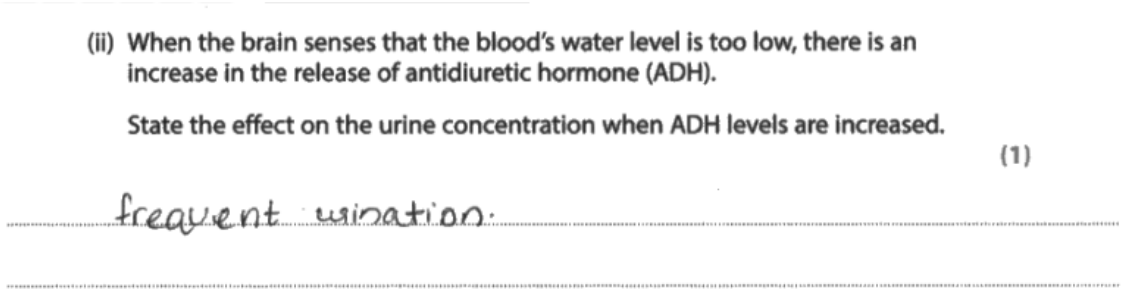
(1)

The urine concentration will increase and get more acidic

Here the learner has included an additional point about the pH of the urine, this is irrelevant to the context of the question and so can be ignored.

Responses which were incorrect generally were not due to learners incorrectly identifying the effect of ADH on urine concentration. In many cases learners referred to changes in pH of the urine, frequency of urination or water levels in the blood and so could not be given a mark as they were not addressing the

context of the question. An example of one of these responses can be seen below:



(ii) When the brain senses that the blood's water level is too low, there is an increase in the release of antidiuretic hormone (ADH).

State the effect on the urine concentration when ADH levels are increased.

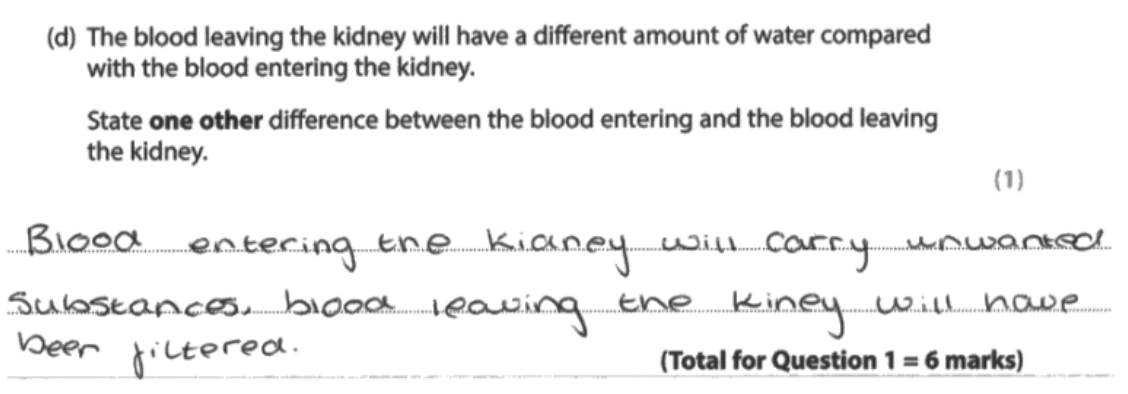
(1)

frequent urination.

This response was awarded 0 marks.

Question 1d

Learners often missed out on marks due to imprecise language when answering this question. A common theme among incorrect answers was the idea of the blood being "cleaned" by the kidney – many answers referred to removal of toxic substances or gave a generic response along the lines of "less waste" as can be seen below:



(d) The blood leaving the kidney will have a different amount of water compared with the blood entering the kidney.

State **one other** difference between the blood entering and the blood leaving the kidney.

(1)

Blood entering the kidney will carry unwanted substances, blood leaving the kiney will have been filtered.

(Total for Question 1 = 6 marks)

This response was awarded 0 marks as it is too generic to meet any of the marking points. Many learners also gave differences in water levels as their response which was a repetition of the stem.

Where learners gave a more specific answers marks could be awarded. An example of a response given 1 mark can be seen below:

(d) The blood leaving the kidney will have a different amount of water compared with the blood entering the kidney.

State **one other** difference between the blood entering and the blood leaving the kidney.

(1)

The blood entering the kidney will have higher concentration of urea

(Total for Question 1 = 6 marks)

Question 2a

Approximately half of learners correctly identified B lymphocytes as the white blood cells responsible for lymphocyte production.

Question 2b

Most learners were able to correctly identify the difference in speed between the primary and secondary immune responses and the majority of learner responses for this question scored at least one of the three marking points. Where learners did not gain any marks, responses often referred only to the concentration of antibodies present and did not link this with how quickly they were produced.

In cases where learners were awarded 1 mark only it was very common to see responses which correctly identified that the secondary response was faster than the primary response but then incorrectly attributed this to the fact that antibodies remained in the body after the first exposure. An example of a learner response given 1 mark can be seen below:

Explain the **difference** between the **speed** of the **primary immune response** and the speed of the **secondary immune response**, shown in Figure 2.

(3)

Primary immune response is slower than secondary immune response as it recieves the first exposure (wasn't prepared). The secondary immune response is faster due to there already being antibodies from first exposure (body is prepared).

This response identified the difference in speed of the two responses for 1 mark but the learner is not able to develop this further into an explanation. Generic responses making statements about the body already "knowing how to fight the infection" or being "familiar" with the disease were also very common.

Many learners correctly linked the presence of memory cells to the increased speed of response, as can be seen in the answer below, given 2 marks:

Explain the difference between the speed of the primary immune response and the speed of the secondary immune response, shown in Figure 2.

(3)

The primary immune response is slower ~~cause~~ to respond and has a short duration whereas the secondary immune response is much quicker due to memory cells knowing how to fight off the same pathogen.

Here the learner has linked the presence of memory cells to the increased speed of the secondary response but has not expanded this further and so has been given 2 out of a possible 3 marks.

The idea that the presence of memory cells allowed for faster production of antibodies was seen in some cases where learners were awarded 3 marks, although it was more common for learners to be awarded the third marking point for the idea that the memory cells were produced during the first exposure to the pathogen.

An example of a learner response given all 3 marks can be seen below:

Explain the difference between the speed of the primary immune response and the speed of the secondary immune response, shown in Figure 2.

(3)

The secondary response is faster because the production of B-memory cells after the primary response means (more of) the correct antibodies are produced, more quickly and lasting longer in the blood when exposed to the pathogen for the second time.

Memory cells ~~recc~~ remember the pathogen and the specific antibodies needed to bind onto its antigens, and remain in the blood for next exposure.

This learner has given a very thorough explanation, actually meeting all 3 marking points within the very first section of their response.

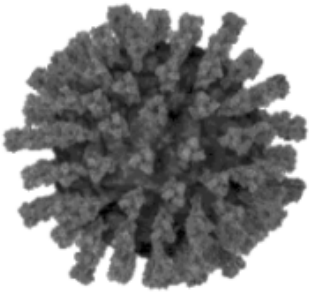
Question 2c

Most learners achieved at least 1 of the possible 3 marks for this question. Isolated statements without further expansion were relatively common here.

In many cases learners repeated or rephrased the stem of the question as their response, and generic statements about the two viruses being different were very common – in some cases learners linked this to the viruses having different structures but this was not developed enough to gain a mark without reference to antigens or surface proteins. An example of a learner response given 0 marks can be seen below:

(c) Chicken pox and measles are both diseases caused by viruses.

Figure 3 shows the structure of these two viruses.



measles virus

chicken pox virus

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Figure 3

If a person is vaccinated against the measles virus, the person can still become ill with chicken pox.

Explain why.

(3)

This is because the person has been vaccinated for measles and not chicken pox so there is an immune response for measles and not chicken pox..

Here the learner has made a statement about the presence of an immune response for one virus and not the other, but this is just too vague to be given credit as it does not serve for an explanation and so the response must be given 0 marks.

In some cases, learners identified that a vaccination for one virus would not produce the correct antibodies for the other virus but did not explain why this was the case. In others, learners identified that the two viruses had different antigens but did not expand this further. An example of a response awarded 1 mark can be seen below:

If a person is vaccinated against the measles virus, the person can still become ill with chicken pox.

Explain why.

(3)

vaccination for measles contain specific antibodies ~~needed~~created by Plasma cells. if the immune system used the same antigen presenting cell for chicken pox the person is highly likely to become affected. The lymphocytes ~~to~~ use different antibodies of ~~to~~ destory different antigens.

Here the learner has explained the specific nature of antibodies and has been given 1 mark but has not made the connection between the different viruses having different antigens. The response also contains a frequently seen misconception that the process of vaccination involves the injection of antibodies for the specific disease. Many learners made reference to the antibodies themselves "fighting off" a virus, without any involvement of white blood cells. There was also an idea that antibodies adapted to different viruses and needed to learn how to recognise them rather than the idea that different antibodies needed to be produced for different pathogens.

There were also some excellent learner responses to this question demonstrating a sound understanding of the process of vaccination and an ability to apply this knowledge to the specific context within the question. An example of a learner response given 3 marks can be seen below:

The vaccination against measles virus ~~means~~ causes a person to form antibodies which have specific variable portions ~~to~~ which can bind to the measles virus. However, these antibodies are only complementary to the measles virus. Therefore, the chicken pox virus will not bind to these antibodies and will therefore remain alive. This means the virus can still attack the cells and infect the body, meaning an individual can still get ill with chicken pox.

Although there is a misconception here about antibody binding preventing the virus from remaining alive this does not detract from any of the correct points made within the response and so the learner is still given full marks.

Question 3a

This question proved challenging for many learners with most learners who scored marks for this item giving responses which fell within Level 1.

The role of the synapse was generally poorly understood with responses often referring to the electrical impulse "jumping" across the gap. Learner responses which gave descriptions of the diagram provided in the stem were common.

An example of a response given a mark in Level 1 can be seen below:

3 (a) Neurones allow impulses to be transmitted within the body.

An impulse passes from one neurone to the next across a synapse.

Figure 4 shows the connection between two neurones, and the structure of the synapse.

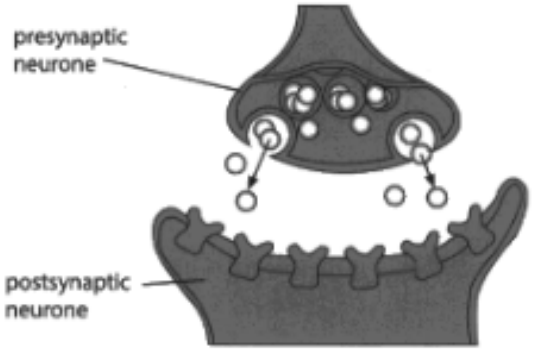


Figure 4

Explain how the presynaptic and postsynaptic neurones allow transmission of the impulse across the synapse.

(6)

The neurotransmitters diffuse down the Synaptic Pathway. ~~The~~ Due the the high concentration on neurtransmitters that may be released the are many channels on the postsynaptic neurone. Any excess is ~~reb~~ reabsorbed

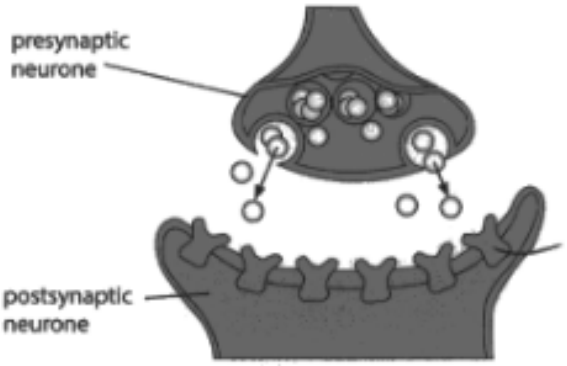
Responses in Level 1 tended to be very brief, containing one or two isolated pieces of knowledge. Here the learner has referred to the role of neurotransmitters and has identified that they cross the synapse by diffusion. There is some mention of a high concentration but no link to concentration gradient – the learner has instead connected this with the idea of channels. These are isolated pieces of information without clear connections or expansions and so the learner is given a mark in Level 1.

The response below is a more developed answer to the question and was given a mark in Level 2.

3 (a) Neurones allow impulses to be transmitted within the body.

An impulse passes from one neurone to the next across a synapse.

Figure 4 shows the connection between two neurones, and the structure of the synapse.



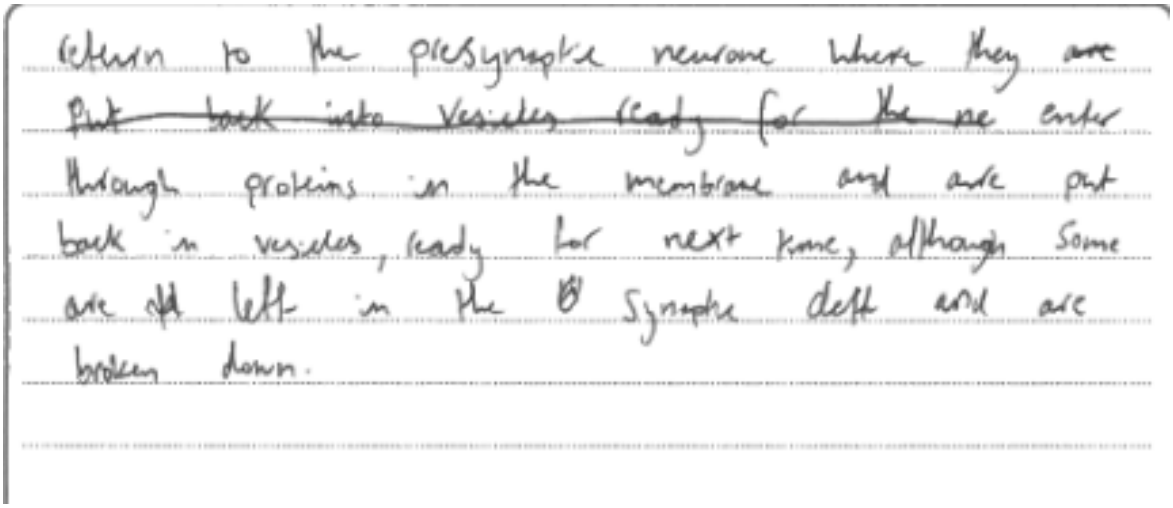
Summation

Figure 4

Explain how the presynaptic and postsynaptic neurones allow transmission of the impulse across the synapse.

(6)

A Firstly, an impulse is sent ~~along~~ down into the presynaptic neurone, causing the vesicles containing neurotransmitters, to move to the cell wall and release the neurotransmitters into the synaptic cleft. These neurotransmitters then diffuse across the cleft from the presynaptic neurone to the postsynaptic neuron. Some of these ~~neurones~~ neurotransmitters have a positive charge and others negative. They then begin to move into the postsynaptic neurone causing a fluctuation of charge until an enough positive charge is reached and the impulse is sent along the postsynaptic neurone, this is called Summation. Afterwards the ~~neurotransmitters~~ neurotransmitters that did not enter the postsynaptic neurone


return to the presynaptic neurone where they are put back into vesicles ready for the ne enter through proteins in the membrane and are put back in vesicles, ready for next time, although some are left in the Synaptic cleft and are broken down.

This learner clearly demonstrates they have a basic understanding of how action potentials cross the synapse. The response explains in greater depth how neurotransmitters are released from vesicles and also has some ideas about reabsorption and repackaging of neurotransmitters in the presynaptic neurone showing that the learner is beginning to develop their lines of reasoning. There is an indication that the learner understands that the arrival of neurotransmitters at the post synaptic neurone is related to a change in charge but the explanation becomes confused as the learner has mistakenly stated that the neurotransmitters themselves are charged particles. Despite the inaccuracies the learner has demonstrated some knowledge of the process and has begun to develop lines of reasoning to form an explanation. Because of this they are awarded a mark in Level 2.

Learners given marks in Level 3 needed to be able to provide an explanation of the process in a greater degree of depth – a Level 3 response will give a clear explanation and demonstrate that the learner has an understanding of cause and effect within the process. An example of a response given a mark in Level 3 is below:

3 (a) Neurones allow impulses to be transmitted within the body.

An impulse passes from one neurone to the next across a synapse.

Figure 4 shows the connection between two neurones, and the structure of the synapse.

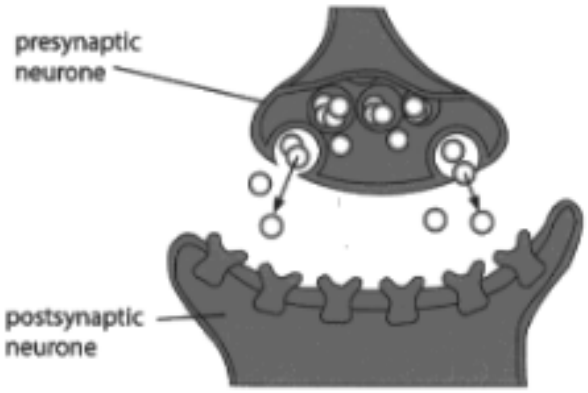
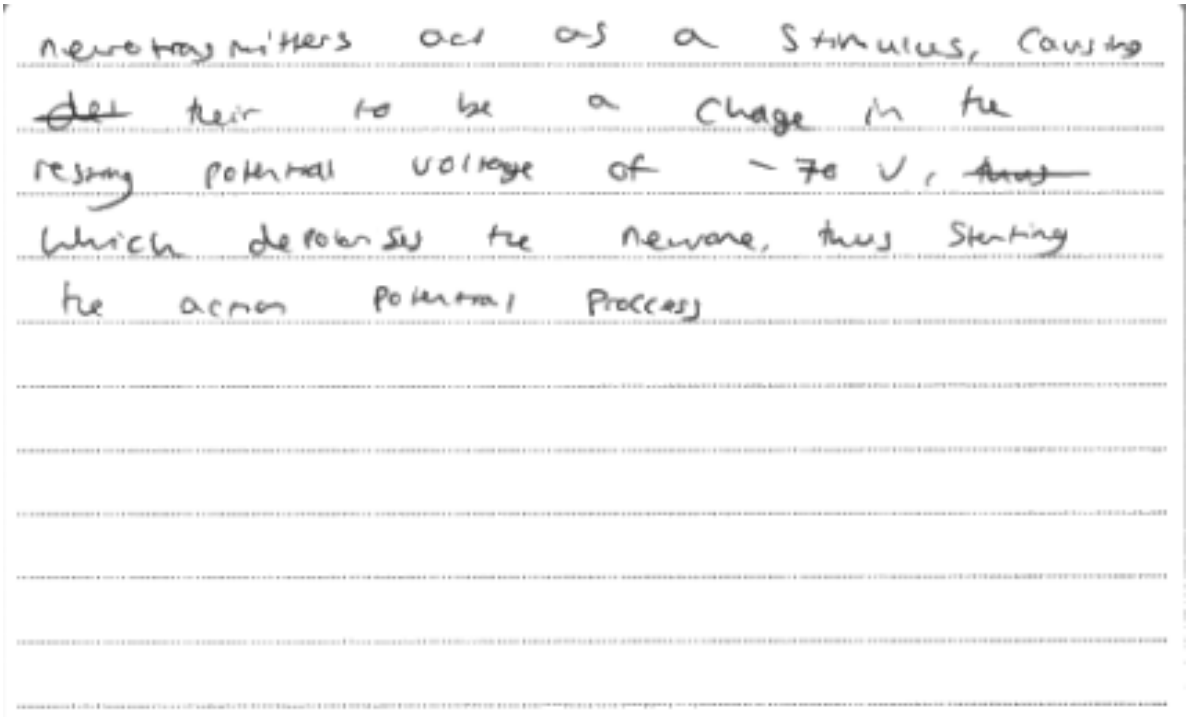


Figure 4

Explain how the presynaptic and postsynaptic neurones allow transmission of the impulse across the synapse.

(6)

Calcium Ions diffuse into the axons membrane terminal which instructs the vesicles to release neurotransmitters, this occurs as the Pre Synaptic neuron has been stimulated by an action Potential or nerve impulse. The neurotransmitters would diffuse across the Synaptic Cleft from a low to high concentration. The neurotransmitters carry the ~~impulse for~~ action Potential/message / message from one neuron to the next. The neurotransmitter binds On the Post Synaptic neurons receptors which starts the action Potential Process again. This happens as the


neurotransmitters act as a stimulus, causing
~~that~~ their to be a chage in the
resting potential voltage of -70 V, ~~they~~
which depolarises the neurone, thus starting
the action potential process

Here the learner is able to link the stages in the process together explaining how one step leads on to the next. They have an appreciation of the role of ions within the process and understand that is interaction between neurotransmitter and receptor that causes the changes in the post synaptic neurone.

Question 3b

This question was well answered in most cases. Where learners lost a mark, this was usually due to their response being too generic to be given credit. An example of a response given 0 marks can be seen below:

(b) A doctor tests the function of the nerves in a patient's leg.

Complete Paragraph 1 to show the outcome of the nerve function test.

(2)

The doctor taps the tendon in the patient's leg with a hammer.

There is no movement of the patient's leg.

The absence of a Motor action indicates there is reduced nerve function.

Paragraph 1

Here the location of "leg" is too general as this information is given in the stem of the question. The learner has also given a generic response of "motor" in

the second part of their answer – this does not emphasise the involuntary nature of the movement and so does not gain the mark.

An example of a learner response gaining both marks can be seen below:

(b) A doctor tests the function of the nerves in a patient's leg.

Complete Paragraph 1 to show the outcome of the nerve function test.

(2)

The doctor taps the tendon in the patient's knee with a hammer.

There is no movement of the patient's leg.

The absence of a reflex action indicates there is reduced nerve function.

Paragraph 1

Here 2 marks are given.

Question 4a

Many candidates could describe the equipment used to obtain ECG readings, although the expected terminology of "electrodes" or "sensors" was rarely seen with most learners instead providing a description of pads stuck on to the skin.

An example of a response given 2 marks can be seen below:

4 (a) A doctor uses an electrocardiogram (ECG) to test a patient's heart function.

Describe how ECG readings are produced.

(2)

ECG readings measure the electric impulses in the heart. Receptor pads are stuck in certain places on the patients chest. This then produces a graph.

Here the learner has not used the expected language in their description of "receptor pads" but the meaning is clear and so the mark can be given. The learner has also been given a mark for their statement that the ECG readings measure the electrical impulses from the heart.

An example of a learner response given 0 marks can be seen below:

4 (a) A doctor uses an electrocardiogram (ECG) to test a patient's heart function.

Describe how ECG readings are produced.

(2)

Sends electical pulses through the heart that resinate through out the heart that measures the heartrate and blood pressure and blood/water lvl

This learner has the misconception the equipment sent electrical impulses to the heart rather than detecting the impulses the heart produces, this was a common theme among incorrect responses. There was also some confusion evident in many learner responses as to what the purpose of the ECG reading was – in many cases learners gave responses which referred to blood pressure or heart rate, as is also seen in the example above.

Question 4bi

Many learners did very well on this question and scored all three marking points. Most learners were able to correctly interpret the graphs given in the stem to determine the number of heart beats and most could then go on to process this correctly to obtain the right answer.

An example of a learner response awarded all 3 marks can be seen below.

Patient A has normal heart function.

Patient B has abnormal heart function.

(i) Calculate, using Figure 5a, the heart rate of patient A in beats per minute (bpm).

(3)

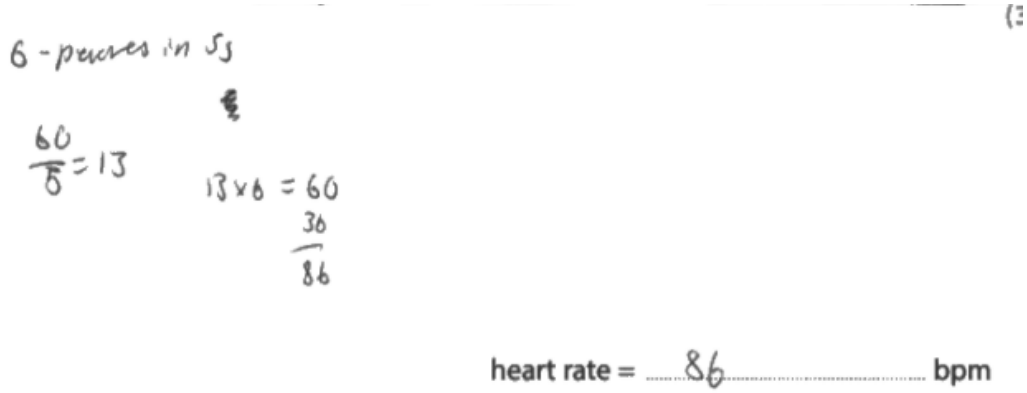
6 beats per 5 seconds

5 x 12 = 60.

6 x 12 = 72.

heart rate = 72 bpm

The response below was awarded 2 marks:

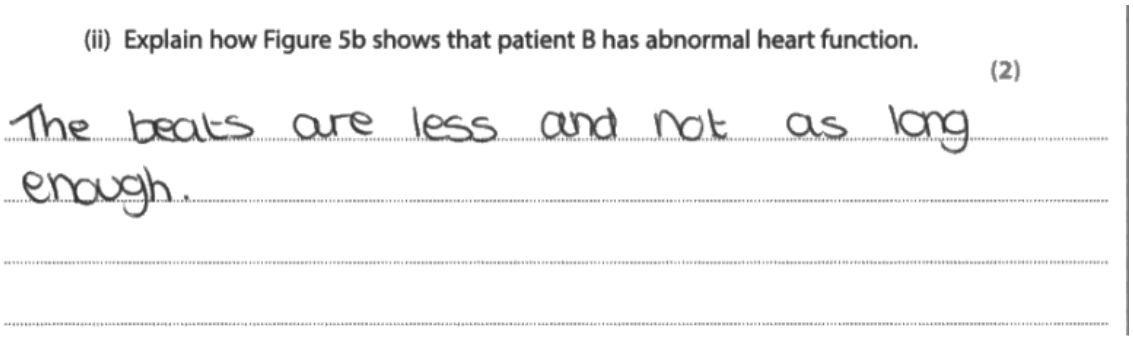


Here the learner has correctly interpreted the graph but has made an error in the middle of their calculation when dividing 60 by 5. However, the next step in their calculation is correct and so they only lose one mark over all.

Question 4bii

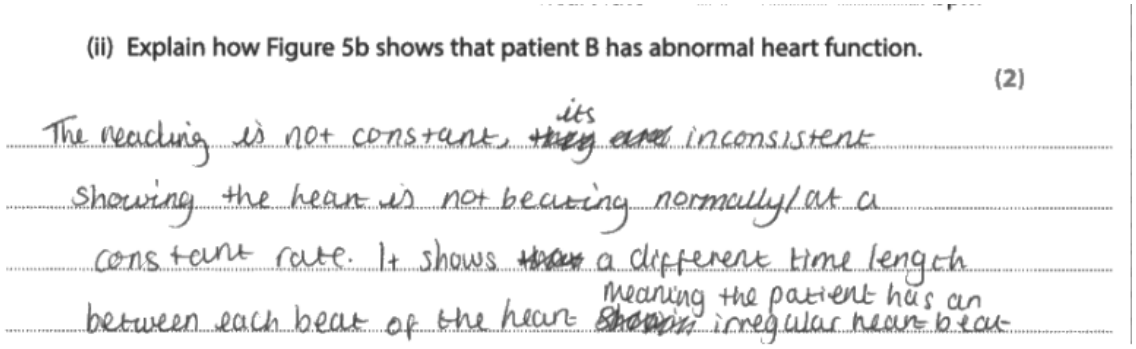
This question required learners to analyse an ECG trace and there was good use of data to support answers in many cases.

Where learners did not score marks responses were often too general and did not make reference to the data given in the question. An example of a response given 0 marks can be seen below:



It was also quite common for learners to repeat stem in their responses, a statement that the heartbeat was abnormal was not sufficient for a mark as this is a rephrasing of the stem of the question.

Learners did not need to quote directly from graph or give specific numbers in their answers, although some chose to do so. Incorrect answers often made reference to shape of the trace. An example of a learner response given 2 marks can be seen below:



(ii) Explain how Figure 5b shows that patient B has abnormal heart function.

(2)

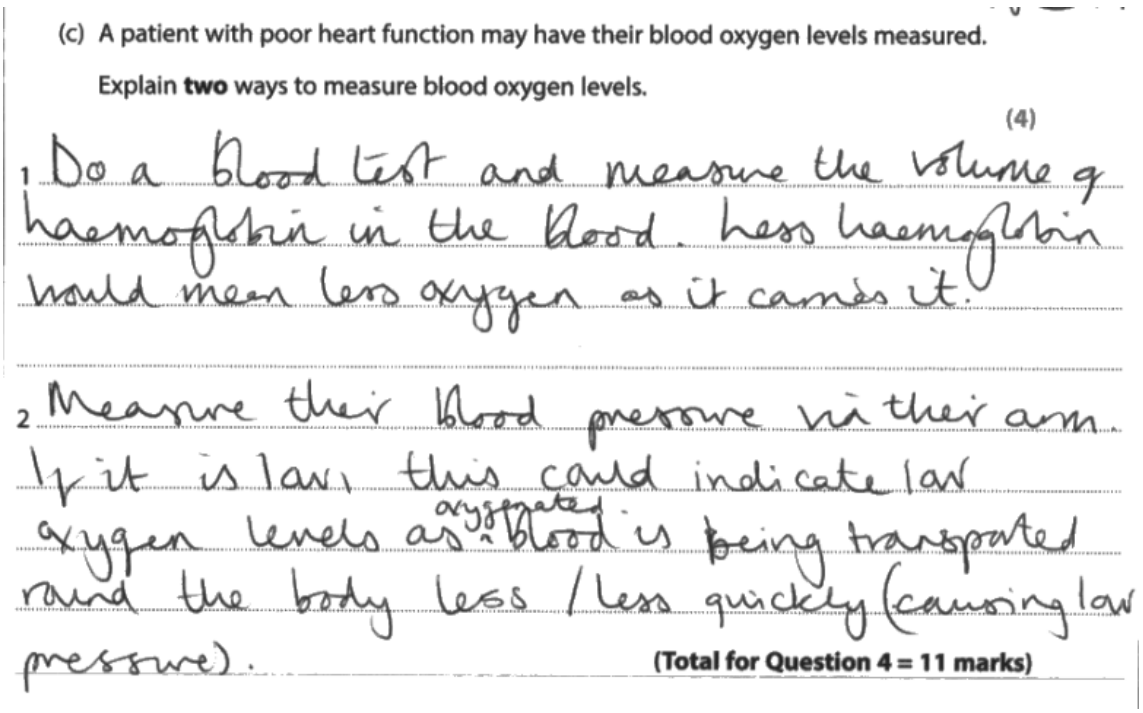
The reading is not constant, ~~they are~~ its inconsistent showing the heart is not beating normally/at a constant rate. It shows ~~how~~ a different time length between each beat of the heart ~~showing~~ meaning the patient has an irregular heart beat

Here the learner is given 2 marks. The statement that the heart is not beating "normally" would not be given a mark on its own as this is a rephrasing of the stem of the question but the reference to the heart not beating at a constant rate is an acceptable description of irregularity in the rhythm and is given a mark (even without the clarification in the final part of the response) The learner does not give numerical data but provides a description of the graph for the second mark.

Question 4c

This question was generally answered poorly with relatively few learners able to identify methods of analysing blood oxygen levels. Where learners did score one or two marks this was largely for identification of the tests only, with no further explanation or expansion.

An example of a learner response given 1 mark can be seen below:



(c) A patient with poor heart function may have their blood oxygen levels measured.

Explain **two** ways to measure blood oxygen levels.

(4)

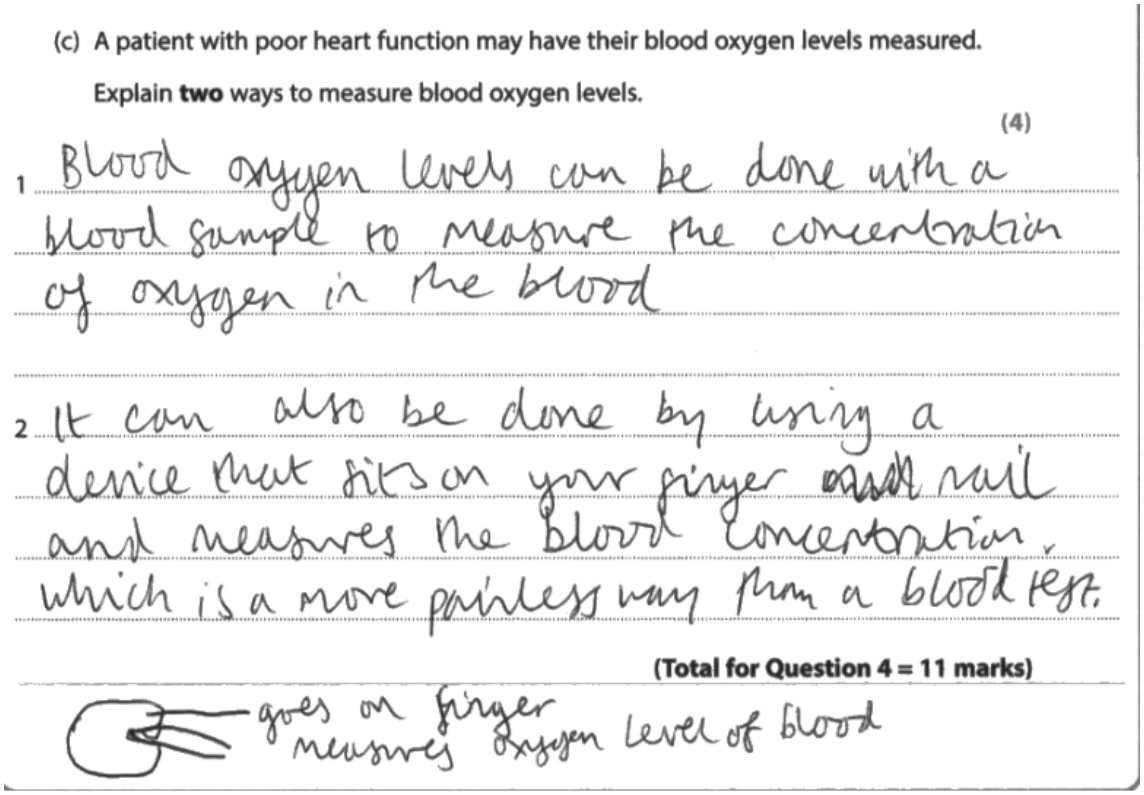
1 Do a blood test and measure the volume of haemoglobin in the blood. less haemoglobin would mean less oxygen as it carries it.

2 Measure their blood pressure via their arm. If it is low, this could indicate low oxygen levels as ~~blood~~ oxygenated blood is being transported round the body less / less quickly (causing low pressure).

(Total for Question 4 = 11 marks)

The learner has been given 1 mark for identification that oxygen levels can be measured through a blood test but has not provided anything else in their answer which can be given a mark. The second half of the response demonstrates that there is confusion between this type of diagnostic testing and blood pressure monitoring. This is a common misconception for this section of the specification and was found in many learner responses.

An example of a learner response scoring 3 marks can be seen below:



(c) A patient with poor heart function may have their blood oxygen levels measured.

Explain **two** ways to measure blood oxygen levels.

(4)

1 Blood oxygen levels can be done with a blood sample to measure the concentration of oxygen in the blood

2 It can also be done by using a device that sits on your finger nail and measures the blood concentration, which is a more painless way than a blood test.

(Total for Question 4 = 11 marks)

goes on finger measures oxygen level of blood

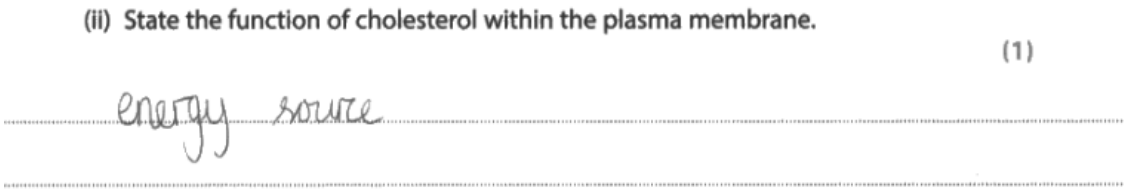
Here the learner has identified a blood test and expanded that this means measuring oxygen concentration for the first method, for the second method although they have not used the correct terminology or named the test this is a clear description of pulse oximetry and so can be given an identification mark. This response gained a total of 3 marks.

Question 5ai

This question was answered correctly by around half of the learners, identifying glycolipids as the component of the plasma cell membrane involved in cell signalling, from the options provided.

Question 5aii

This question was answered incorrectly by most learners. The most frequent misconception was that cholesterol acted as a source or store of energy for the plasma membrane. This can be seen below in a learner response awarded 0 marks.

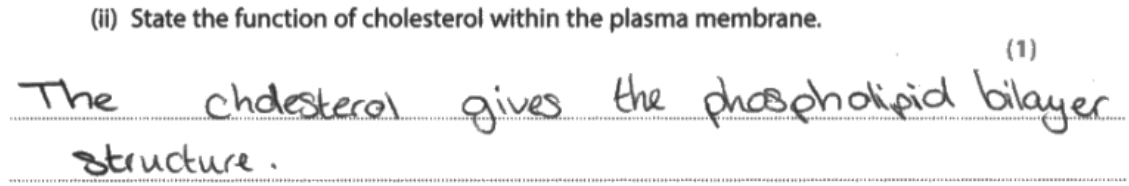

(ii) State the function of cholesterol within the plasma membrane.

(1)

energy source

Most of the correct responses were phrased in terms of cholesterol generally providing structure to the membrane – this was absolutely sufficient for the single marking point although some learners did provide an explanation with their answer, which was not needed for the command word "state".

An example of a learner response given 1 mark can be seen below:


(ii) State the function of cholesterol within the plasma membrane.

(1)

The cholesterol gives the phospholipid bilayer structure.

Question 5b

This question had a broad range of responses from learners with most scoring either 1 or 2 marks. The identification that both types of diffusion involve movement of particles down a concentration gradient was the most common mark given, with some learners able to link this to passive process. However, where learners were given two marks this was typically for the identification points for both similarity and difference and not for an identification and linked expansion.

Where learners did not score any marks for the question their answers tended to be too generic, often rewording the stem of the question and not providing any additional information. An example of a learner response given 0 marks can be seen below:

(b) Substances can move across the plasma membrane by simple diffusion or facilitated diffusion.

both moving particle

Explain **one** similarity and **one** difference between simple diffusion and facilitated diffusion.

(4)

Similarity

both types of diffusion is moving particles across a membrane

Difference

facilitated diffusion is travelling from a ~~high concentration~~ high concentration to a low concentration

Here the learner has re worded the stem for the similarity and for the difference they have given a description which would count as a similarity.

The response below is an example of a learner whose response only gives an identification point for both similarity and difference.

(b) Substances can move across the plasma membrane by simple diffusion or facilitated diffusion.

Explain **one** similarity and **one** difference between simple diffusion and facilitated diffusion.

(4)

Similarity

Both move substances down a concentration gradient

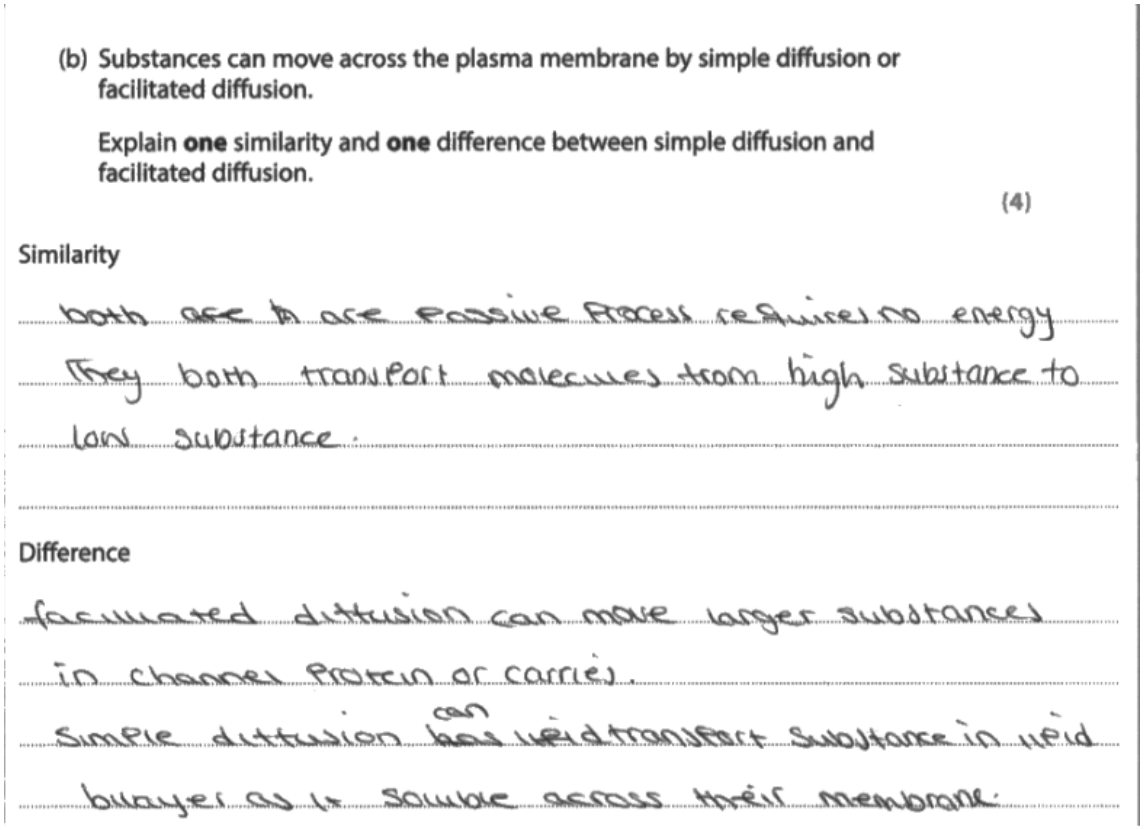
Difference

Diffusion is (a passive process) and happens naturally but facilitated diffusion requires channel / carrier proteins.

In this example the learner has correctly identified that both forms of diffusion move substances down a concentration gradient but has not expanded this any further. For the difference the learner has stated that facilitated diffusion requires protein channels/carrier proteins and has been given the second identification mark. (The comment on the passive nature of diffusion can be ignored as the learner hasn't gone on to incorrectly state that facilitated diffusion is an active process) This response was given 2 marks.

Facilitated diffusion using channels/proteins was the feature given most often as difference. Confusion between facilitated diffusion and active transport was evident in many learner responses and many incorrect answers about facilitated diffusion requiring energy were seen.

A learner response awarded full marks can be seen below:



(b) Substances can move across the plasma membrane by simple diffusion or facilitated diffusion.

Explain **one** similarity and **one** difference between simple diffusion and facilitated diffusion.

(4)

Similarity

both are a are passive Process requires no energy They both transport molecules from high substance to low substance.

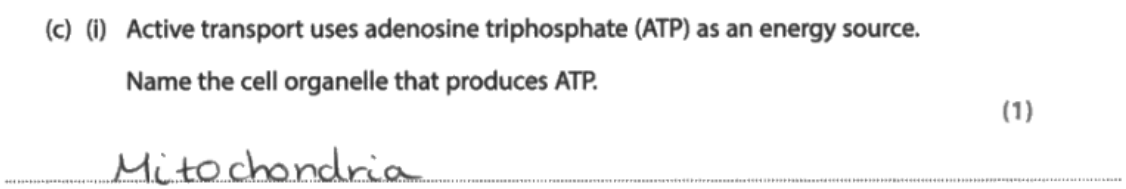
Difference

facilitated diffusion can move larger substances in channel protein or carrier. Simple diffusion can also transport substance in lipid bilayer as is soluble across their membrane.

Here the learner has correctly expanded on both identification points and has been given 4 marks. The learner has initially explained the need for channel proteins within the context of size of the substances being transported. This was a common expansion but in many cases the comment about molecule size was given without link to ability to pass across plasma membrane – not enough for a mark on its own. In this case the learner has clarified that simple diffusion is used when substances are soluble in the phospholipid bilayer which earns them the fourth marking point for the question.

Question 5ci

This was answered correctly by most learners. An example of a correct learner response, given 1 mark can be seen below:



(c) (i) Active transport uses adenosine triphosphate (ATP) as an energy source.

Name the cell organelle that produces ATP.

(1)

Mitochondria

Many incorrect responses referred to ribosomes either as named organelles or as part of the rough endoplasmic reticulum. The response below was given 0 marks:

(c) (i) Active transport uses adenosine triphosphate (ATP) as an energy source.

Name the cell organelle that produces ATP.

(1)

Ribosome Mitochondria

Question 5cii

This question proved challenging for learners with very few understanding the role of ATP within the cell. Some responses named cell processes, such as active transport, which require energy or gave a generic answer about the ATP being "broken down" without any further expansion.

A common misconception was the idea that the ribose sugar is used as a substrate with many learners stating that ATP is used in respiration. An example of a response along these lines can be seen below:

(ii) ATP contains a molecule of adenine, a ribose sugar and three phosphate groups.

Figure 7 shows a molecule of ATP.

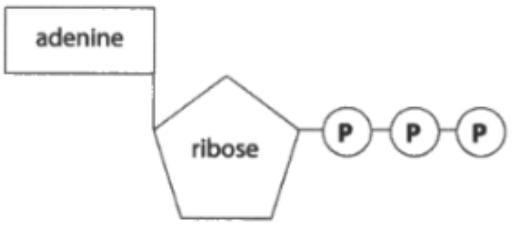


Figure 7

Describe how the cell uses ATP to provide energy.

(3)

ATP can break down the ribose sugar into glucose to give energy to its surroundings. There are 5 ribose sugar as well adding more energy to as well we on respiration again (ATP synthesis).

Here the learner has taken the idea that ribose is a sugar and tried to link this with the process of respiration. This answer was awarded 0 marks.

An example of a learner response given 3 marks can be seen below:

(ii) ATP contains a molecule of adenine, a ribose sugar and three phosphate groups.

Figure 7 shows a molecule of ATP.

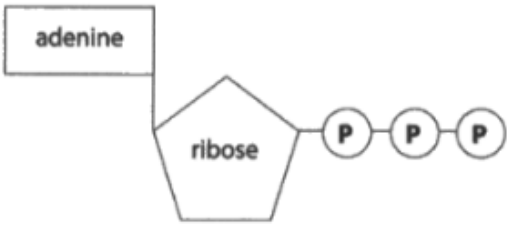


Figure 7

Describe how the cell uses ATP to provide energy.

(3)

Through the process of hydrolysis, the bonds between one of the phosphates breaks which ~~creates a burst of energy~~ causes energy to be produced and stored in the mitochondria of the cell. Because the hydrolysis reaction has caused the ATP to turn into ADP the process can continue.

Here the learner has been given 3 marks for their response. Some learners could explain that energy was released (although often this was phrased as "produced" as in this example which, while accepted was not ideal phrasing) when a phosphate group was removed but there were very few responses that demonstrated an understanding of where this energy came from in terms of chemical bonds.

Question 6a

Nearly all learners correctly identified the role of calcium in healthy bone growth.

Question 6b

The responses to this question indicated that in many cases learners did not have a solid grasp of the fundamental biological process of digestion. While there were some excellent answers there were also many responses which revealed some very basic misconceptions surrounding this topic.

An example of a response given a mark in Level 1 is below:

Discuss how chemical processes break food down as it passes through the digestive system.

Your answer should include

- the role of enzymes
- how optimum conditions help digestion.

(9)

Digestive enzymes will ~~bind onto~~ break down food by ~~the~~ latching onto ~~proteins~~ substances like proteins in the food through the lock and key method. The protein that is then broken down in the enzyme and released. Enzymes need certain conditions to work so if its too hot or cold, the the enzyme will denature. Substances are also extracted from the intestine by villi and transported through the blood.

Here the learner has been given a mark in Level 1 as their answer demonstrates some isolated pieces of knowledge but lacks the depth or logical structure required to make this an effective discussion. The information given here is very basic and lacks specificity and application to the context of the question.

Where learners gave responses in Level 2 there tended to be an appreciation of the stages involved in digestion, although there was occasionally confusion as to which organs were part of the digestive system. Many learners made incorrect statements such as that food travelled through the trachea to the stomach or that the food passed through the liver.

An example of a learner response given a mark in Level 2 can be seen below:

Discuss how chemical processes break food down as it passes through the digestive system.

Your answer should include

- the role of enzymes
- how optimum conditions help digestion.

(9)

• Food / any substance enters the mouth and is chewed by teeth
• This triggers salivary glands to secrete the enzyme, amylase
• Amylase moists substance for easier swallowing and breaks down any starch into sugar (for later digestion)
• Once ingested, the oesophagus carries this food to the stomach (lubricating it)
• When food arrives in the stomach, it is at an optimum pH of 8 for digestive enzymes to thrive
• Protease for example starts to break down the proteins for absorption into blood stream
• Next the food enters the duodenum where pancreatic juices (from pancreatic duct) are squirted onto it as well as more digestive enzymes breaking down food for absorption into →

blood stream

- Food goes through all or small intestine, while large intestine is at a part
- [illegible]
or 8 for digestive enzymes to completely break down food for assimilation
- Any indigested food arives at rectum to leave body

(Total for Question 6 = 10 marks)

This response is typical of one in Level 2 – the learner has begun to provide more detail to support their discussion. The response is structured to describe the passage of food through the digestive system which was a very common choice for learners answering this question. There is evidence that the learner has an appreciation of the role of enzymes within digestion and throughout the response there is the concept of specific enzymes breaking down different substrates. This response begins to discuss the idea of optimum conditions for enzyme action, however this is only partially developed and contains inaccuracies in places and so does not progress beyond a Level 2.

Responses in Level 3 were relatively rare, but a very good example can be seen below:

Enzymes are proteins which help ~~bre~~ by catalysing the breakdown of molecules. The induced fit model explains how enzymes have an active site which is complementary to the substrate of a molecule. ~~The active site~~ It's suggested the active site breaks hydrogen bonds to fit the substrate. The energy can be used for activation energy of the enzyme.

Chemical digestion begins in the mouth where salivary amylase is secreted by the salivary glands to help breakdown carbohydrates into maltose.

Hydrochloric acid in the stomach helps further break down food. This helps neutralise bile ~~released~~ made from the liver.

Bile salts are ~~released~~ ~~made~~ made in the liver. Bile is then secreted by the gall bladder. This causes the emulsification of lipids into fat droplets. Lipids are ~~sol~~ insoluble in the aqueous digestive system due to their hydrophobic phosphate heads. Therefore, when lipids are emulsified into fat ~~molec~~ globules it allows them to dissolve as the fat droplets are hydrophillic.

The pancreas also ~~secretes~~ secretes pancreatic amylase which further breaks down carbohydrates into maltose. These conditions need to remain alkaline for optimum enzyme action.

Proteins are broken down in the small intestine. ~~Proteases~~ Enzymes such as endopeptidases hydrolyse polypeptide chains from the ends. Trypsin and pepsin are also secreted to

help break down protein into amino acids. Effective enzyme ~~a~~ action occurs in alkaline conditions.

If enzymes are not in optimum conditions, they'll take time to have been efficiently or will denature. ~~This would be Increase~~ Increasing temperature increases the number of collisions, meaning an active site will bind on complementary substrate faster. However, too high of a temperature will lead to a change in active site shape which makes it no longer complementary. Optimum body temperature is 37.5°C. pH can also affect optimum enzyme action. pH can affect the hydrogen bonds which affects the charge of an R group. This changes the ~~tertiary~~ shape of a protein and now the shape of a substrate. The more substrate available, the more likelihood of an active site binding.

Here the learner has demonstrated an understanding that different enzymes require different conditions for optimal function and has developed their discussion to explain how function of various parts of the digestive system allows for these conditions to be created. The learner has brought in knowledge from other areas of the specification and has linked this to the specific context given in the question. Taken together these features place the response in Level 3.

Question 7ai

Most learners could correctly identify the complimentary RNA sequence for the DNA sequence provided.

Question 7aii

This question was answered well by many learners. An example of a learner response awarded 1 mark can be seen below:

(ii) Give the number of codons shown in the section of DNA in Figure 9.

(1)

Six

There was no preference in format of learner responses – a mark was given for a correct answer whether written out as in the example above or given numerically.

Incorrect answers usually gave the number of bases rather than the number of codons as can be seen in the response below:

(ii) Give the number of codons shown in the section of DNA in Figure 9.

(1)

18 codons

This response was given 0 marks, the learner has counted the number of bases in the DNA section but has not divided by three to give the number of codons.

Question 7bi

Less than half of learners were able to correctly identify the process described in the question. This is a common theme throughout the exam paper where learners struggle to either recognise or use accurate terminology for biological processes.

Question 7bii

This question was challenging for many learners with a lot of responses not scoring any marks. In many cases learners gave generic answers based on a description of the diagram given in the stem of the question. An example of a response given 0 marks can be seen below:

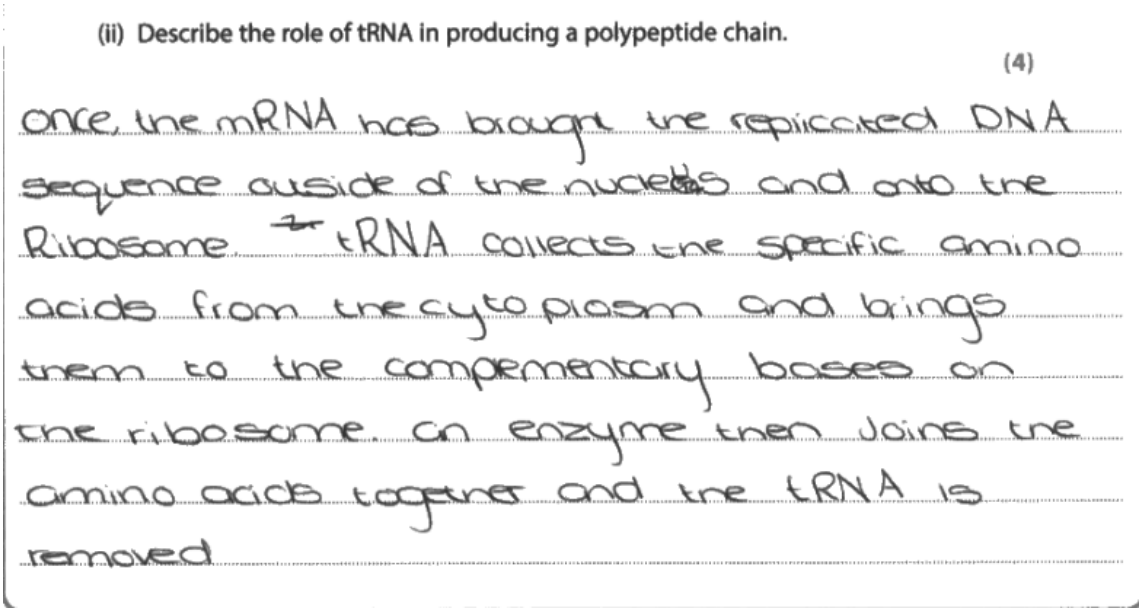
(ii) Describe the role of tRNA in producing a polypeptide chain.

(4)

tRNA plays an important role in producing a polypeptide chain, as tRNA is able to form the polypeptide chain through amino acids - which can produce to come from proteins. amino acids form / code for the base of proteins ; this means that as ribosomes undergo protein proteinsynthesis, amino acids are used to form a polypeptide chain through the mRNA, tRNA and ribosome complex in the cytoplasm. this happens through a cytokinisis, where the mRNA molecule is able to leave the nucleus and then enter the cytoplasm.

Here the learner has given lots of general statements but does not manage to correctly apply any of these to the context of the question beyond repeating information taken directly from the stem and the diagram within the question and so there is nothing creditworthy within the response.

In some cases learners had the correct idea but lacked the depth needed to develop their description far enough. The example below was given 2 marks.



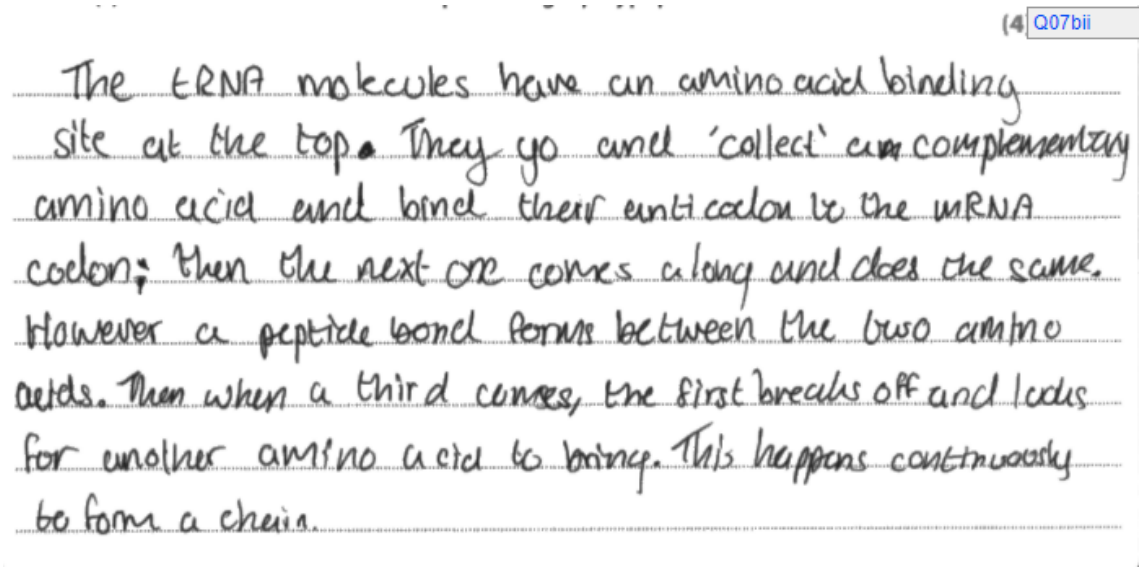
(ii) Describe the role of tRNA in producing a polypeptide chain.

(4)

once the mRNA has brought the replicated DNA sequence outside of the nucleus and onto the Ribosome. tRNA collects the specific amino acids from the cytoplasm and brings them to the complementary bases on the ribosome. An enzyme then joins the amino acids together and the tRNA is removed

Here the learner has explained about the link between specific amino acids and the tRNA molecule as well as introducing the idea of complimentary bases on the mRNA strand. However, the rest of the response is too vague to meet any of the rest of the marking points.

An example of a response gaining full marks is seen below:



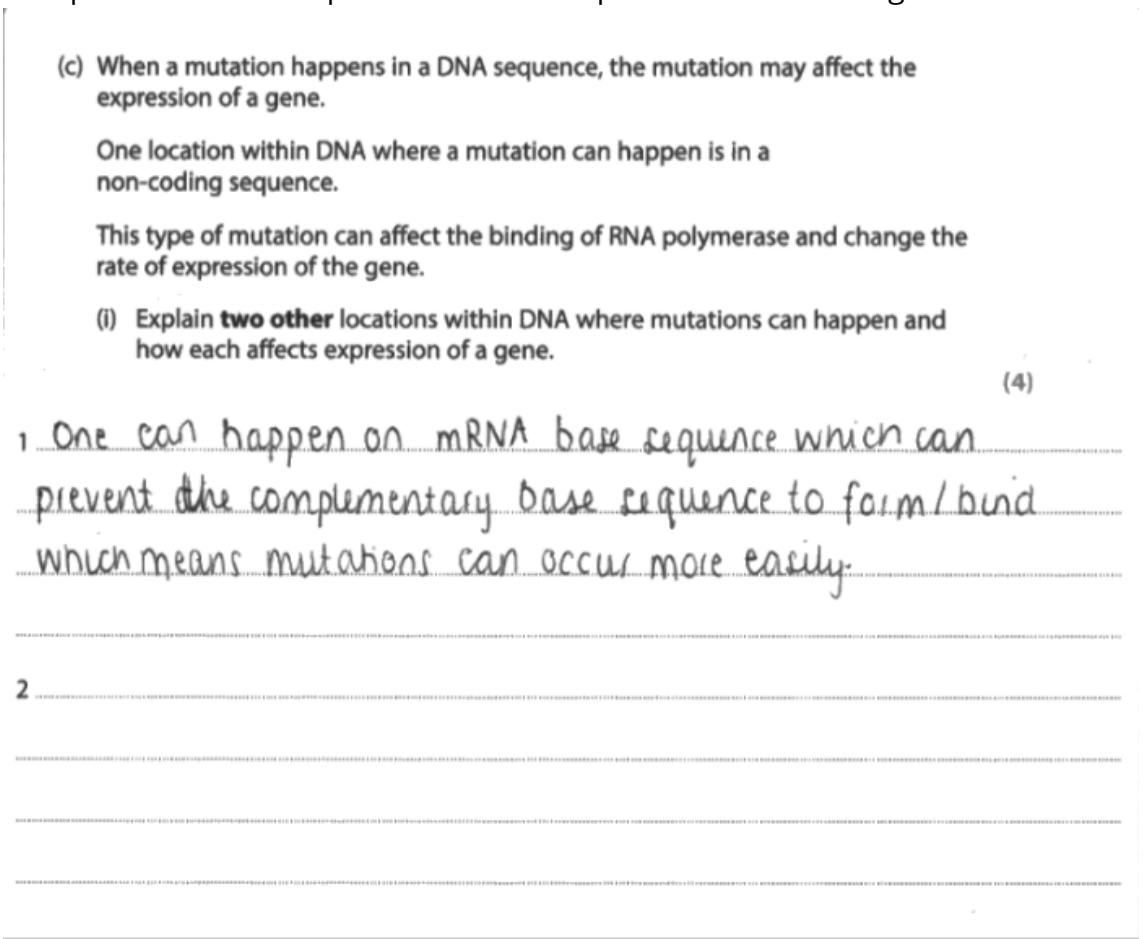
(4) Q07bii

The tRNA molecules have an amino acid binding site at the top. They go and 'collect' a complementary amino acid and bind their anticodon to the mRNA codon; then the next one comes along and does the same. However a peptide bond forms between the two amino acids. Then when a third comes, the first breaks off and looks for another amino acid to bring. This happens continuously to form a chain.

Here the learner has given a thorough and detailed description of the role of tRNA in protein synthesis, this response has been given 4 marks.

Question 7ci

This question required learners to take their knowledge of mutations and apply this to a specific context. In some cases, learners struggled to correctly interpret the question. An example of a learner response demonstrating this is below:



(c) When a mutation happens in a DNA sequence, the mutation may affect the expression of a gene.

One location within DNA where a mutation can happen is in a non-coding sequence.

This type of mutation can affect the binding of RNA polymerase and change the rate of expression of the gene.

(i) Explain **two other** locations within DNA where mutations can happen and how each affects expression of a gene.

(4)

1 One can happen on mRNA base sequence which can prevent the complementary base sequence to form/bind which means mutations can occur more easily.

2

Here the learner has made a statement about the mRNA rather than the DNA – this does not address the correct context from the question and so is given 0 marks. Responses given in the context of RNA were relatively common, there were also many examples of learners attempting to describe a mutation in the tRNA.

There were also many learner responses in which the command word was not correctly addressed. These answers tended to be in the form of descriptions or statements rather than explanations. An example of this can be seen below:

(c) When a mutation happens in a DNA sequence, the mutation may affect the expression of a gene.

One location within DNA where a mutation can happen is in a non-coding sequence.

This type of mutation can affect the binding of RNA polymerase and change the rate of expression of the gene.

(i) Explain **two other** locations within DNA where mutations can happen and how each affects expression of a gene.

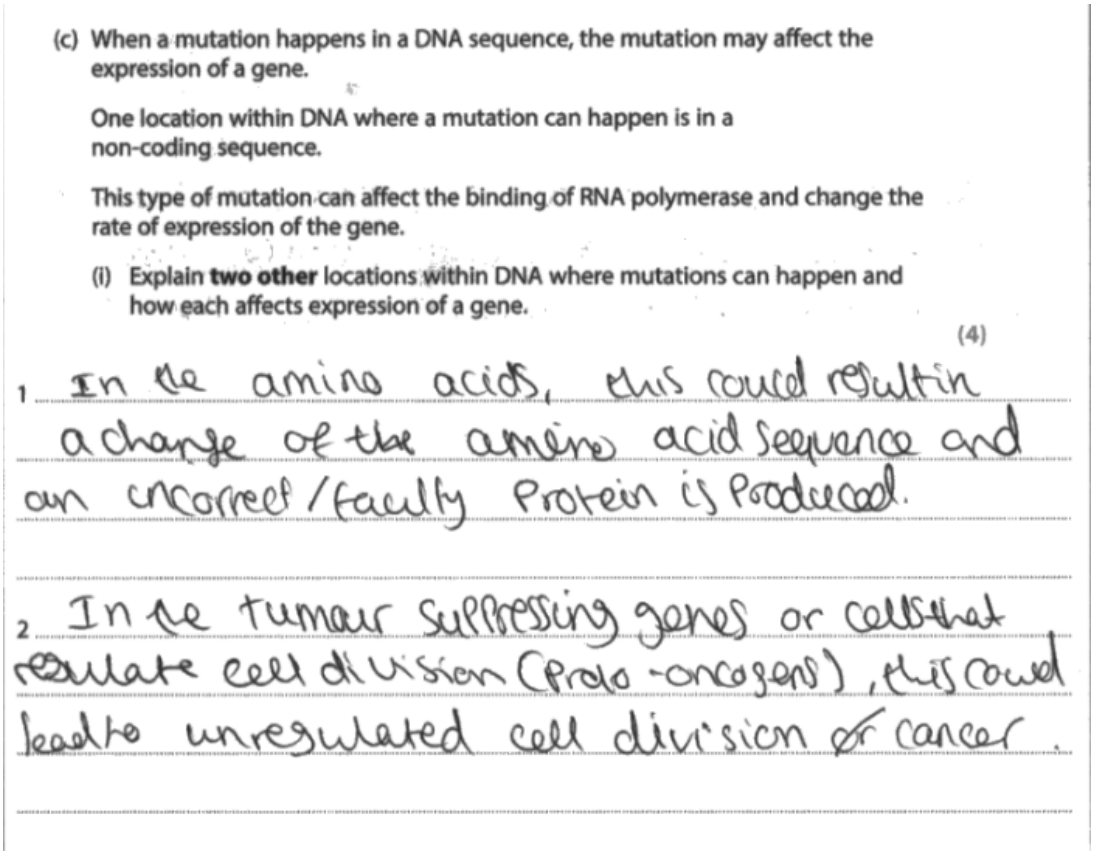
(4)

1 The coding sequence tumor suppressor gene.

2 proto-onco gene

Here, the learner has been given the maximum of 2 identification marks as they have listed three locations within the DNA where mutations may have an effect on gene expression. Without further expansion on any of these they are not able to access further marks for the question.

An example of a learner response given 3 marks can be seen below:



(c) When a mutation happens in a DNA sequence, the mutation may affect the expression of a gene.

One location within DNA where a mutation can happen is in a non-coding sequence.

This type of mutation can affect the binding of RNA polymerase and change the rate of expression of the gene.

(i) Explain **two other** locations within DNA where mutations can happen and how each affects expression of a gene.

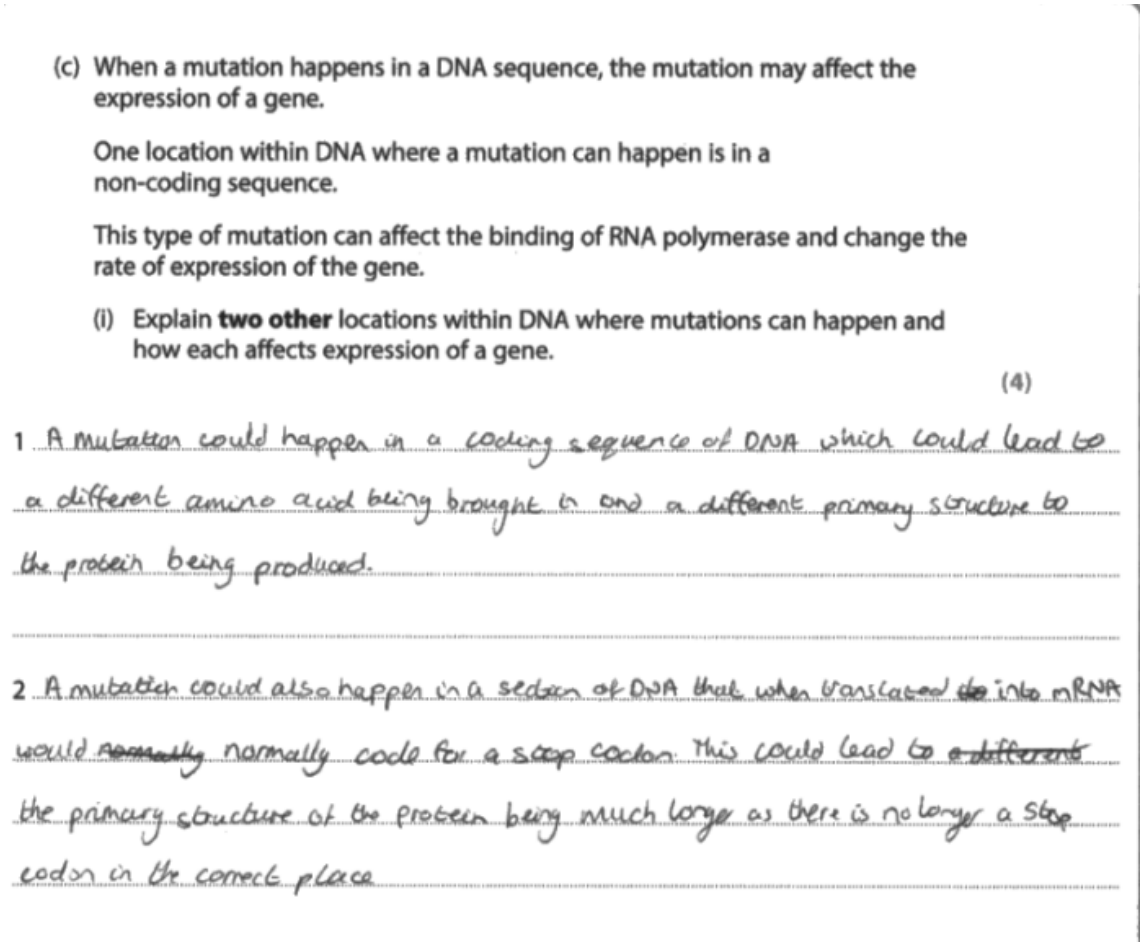
(4)

1 In the amino acids, this could result in a change of the amino acid sequence and an incorrect / faulty Protein is Produced.

2 In the tumour suppressing genes or cells that regulate cell division (Proto-oncogens), this could lead to unregulated cell division or cancer.

In this response the learner has correctly identified and expanded on the role of tumour suppressor genes in control of cell division and has been given 2 marks for this section of their response. The first section of the response is given 1 mark as the description of an incorrect amino acid sequence is correct but the location given of "in the amino acids" is too vague to be given credit as it does not directly link to the DNA sequence. A total of 3 marks is given.

A learner response given full marks can be seen below:



(c) When a mutation happens in a DNA sequence, the mutation may affect the expression of a gene.

One location within DNA where a mutation can happen is in a non-coding sequence.

This type of mutation can affect the binding of RNA polymerase and change the rate of expression of the gene.

(i) Explain **two other** locations within DNA where mutations can happen and how each affects expression of a gene.

(4)

1 A mutation could happen in a coding sequence of DNA which could lead to a different amino acid being brought in and a different primary structure to the protein being produced.

2 A mutation could also happen in a section of DNA that when translated ~~the~~ into mRNA would ~~normally~~ normally code for a stop codon. This could lead to ~~a different~~ the primary structure of the protein being much longer as there is no longer a stop codon in the correct place

Here the learner has identified two locations within the DNA where a mutation could affect gene expression. They have correctly expanded on each of these identification points to give an explanation of how a mutation could lead to a change in gene expression and so have been given the maximum of 4 marks for this question.

Question 7cii

This question showed that while learners are familiar with the idea of mutations within the DNA there is a general lack of understanding of the mechanism behind how these changes may affect protein synthesis.

An example of a learner response scoring 0 marks can be seen below:

(ii) A mutation in a gene **may not** result in a change to the protein produced.

Explain why the same protein might still be produced after a mutation in the DNA.

(3)

Sometimes the change maybe insignificant due to the protein produced is not very specific therefore a minor change is not resulting in a mutational impact.

This response shows the learner does not have an understanding of how mutations cause changes in the protein sequence – which is the foundation needed before this knowledge can be applied to a specific context such as in this question. Responses like this one were common, with learners often making statements about mutations being "too small" or "minor" and so not having an effect – the idea that the cell might not "notice the mutation" was also seen in many cases. Another common theme seen in these responses was the idea that even if the structure of the protein changed would still be the same protein if it served the same function.

An example of a learner response given 2 marks is below:

(ii) A mutation in a gene **may not** result in a change to the protein produced.

Explain why the same protein might still be produced after a mutation in the DNA.

(3)

This could be a silence mutation. for example there is many combinations of nucleotide bases that code for one amino acid. Eg: ACG will code for one amino acid if the mutation occurs in this codon and a nucleotide base is added the codon could now read AGC, which will still code for the same amino acid, therefore no affect is seen on the protein produced.

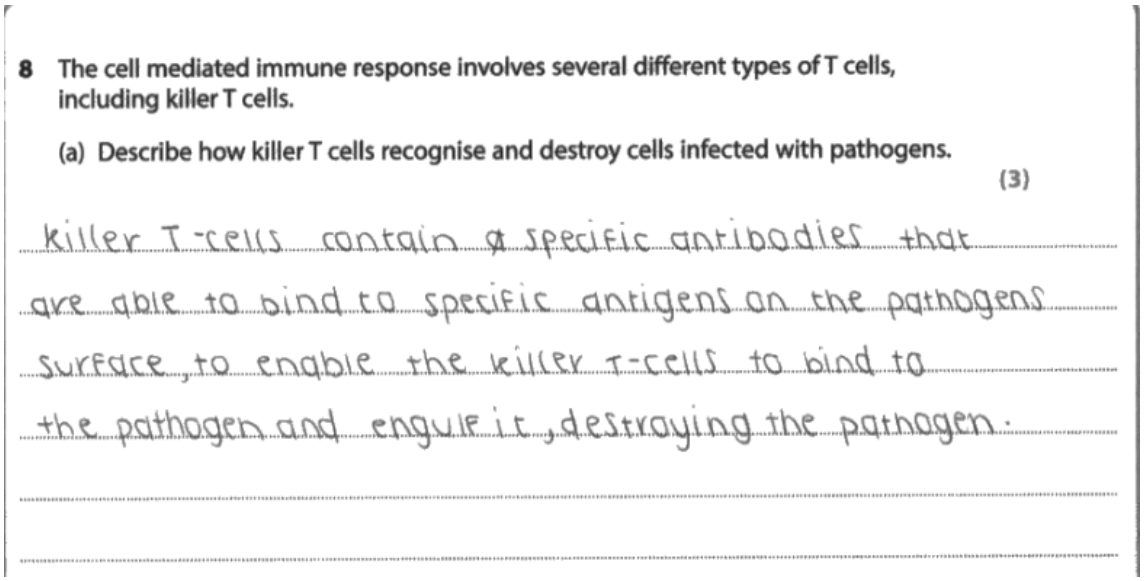
(Total for Question 7 = 14 marks)

Here the learner has correctly applied their understanding of the topic to the specific context of the question, and they have been given 2 marks for their response. They have identified that a change in base may not result in a change in amino acid as each one is coded for by more than one codon – this covers two of the marking points as given in the mark scheme. The learner has missed out on the final marking point for this question as they have not followed their line of argument through to the logical conclusion by expanding this further and linking to the primary structure of the protein.

Question 8a

This question proved difficult for learners with very few awarded full marks. The role of antigen recognition tended to be the most well understood element of the question with most learner responses awarded one or more marks correctly describing the binding between the killer T cells and antigens – although the idea that it was the specific receptors on the T cells that were involved in this process was missing in most responses.

An example of a learner response given 1 mark can be seen below:



8 The cell mediated immune response involves several different types of T cells, including killer T cells.

(a) Describe how killer T cells recognise and destroy cells infected with pathogens.

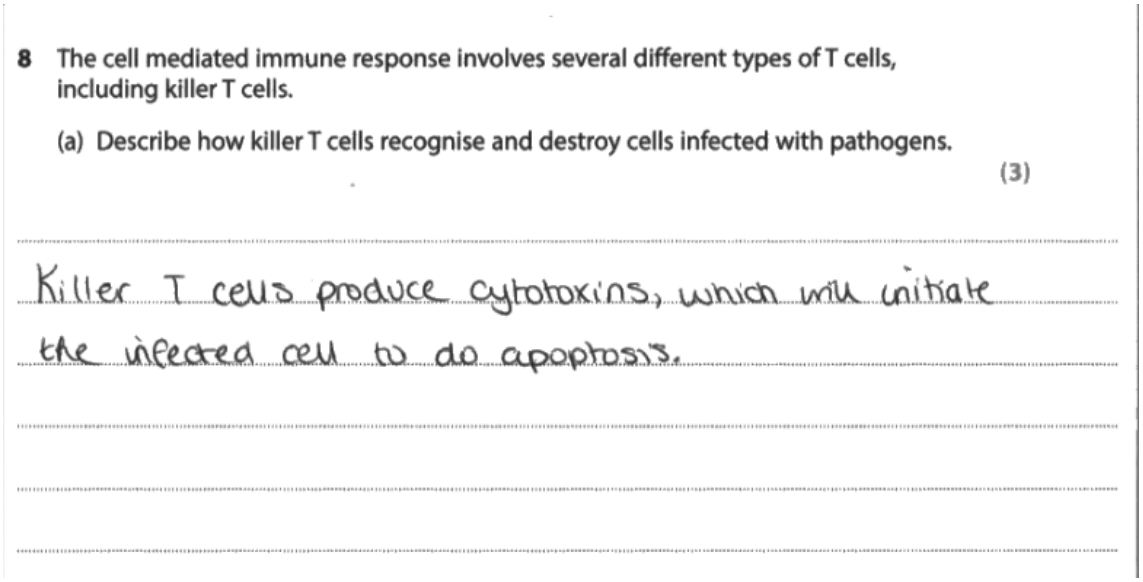
(3)

killer T-cells contain a specific antibodies that are able to bind to specific antigens on the pathogens surface, to enable the killer T-cells to bind to the pathogen and engulf it, destroying the pathogen.

Here the learner has described the binding of the T cell with the antigen, although they have incorrectly identified this as being on the pathogen itself rather than on the infected cell which was a common theme in learner responses – application of knowledge to the specific context of the question was relatively rare.

A very common misconception was that T cells engulf pathogens, as can be seen in the response above, many learners referred to lysozymes indicating a confusion between the role of T cells and phagocytes.

An example of a learner response given 2 marks can be seen below:



8 The cell mediated immune response involves several different types of T cells, including killer T cells.

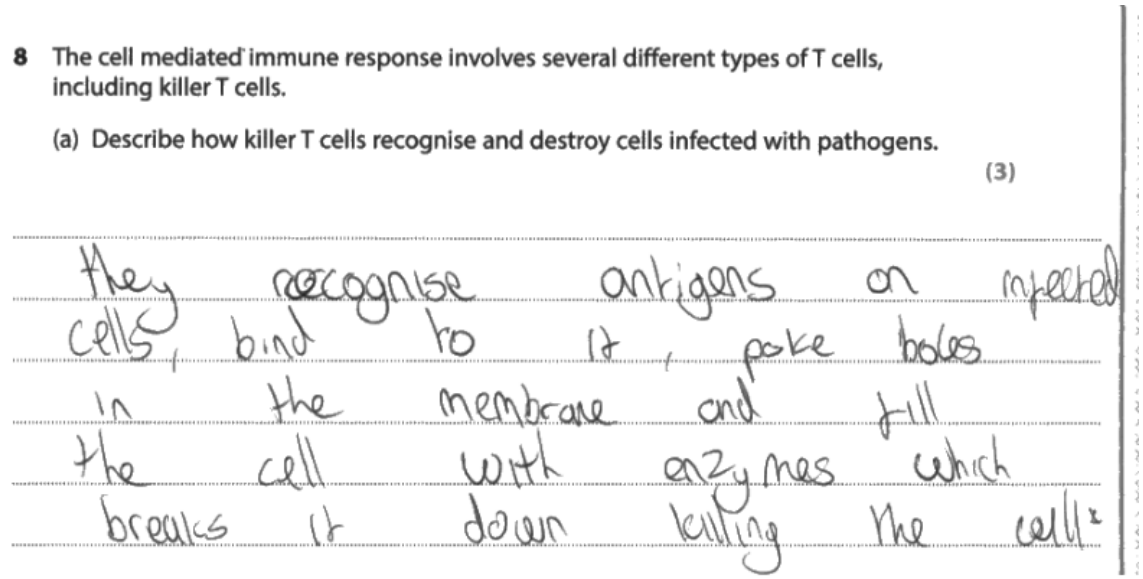
(a) Describe how killer T cells recognise and destroy cells infected with pathogens.

(3)

Killer T cells produce cytotoxins, which will initiate the infected cell to do apoptosis.

Here there is no description of how the T cell recognises the infected cell but the learner has provided a description of how the T cell is able to destroy the infected cell and is given 2 marks for the production of cytotoxins and the naming of apoptosis as the process of cell death.

Among the answers given full marks there were some excellent descriptions of antigen presentation and the role of T cell receptors showing a strong grasp of correct biological terminology throughout. However, it should also be stressed that even where learners struggle to engage with the more complex terminology in this topic this did not prevent them from being able to access full marks. An example of a learner response given 3 marks can be seen below:



8 The cell mediated immune response involves several different types of T cells, including killer T cells.

(a) Describe how killer T cells recognise and destroy cells infected with pathogens.

(3)

they recognise antigens on infected cells, bind to it, poke holes in the membrane and fill the cell with enzymes which breaks it down killing the cell x

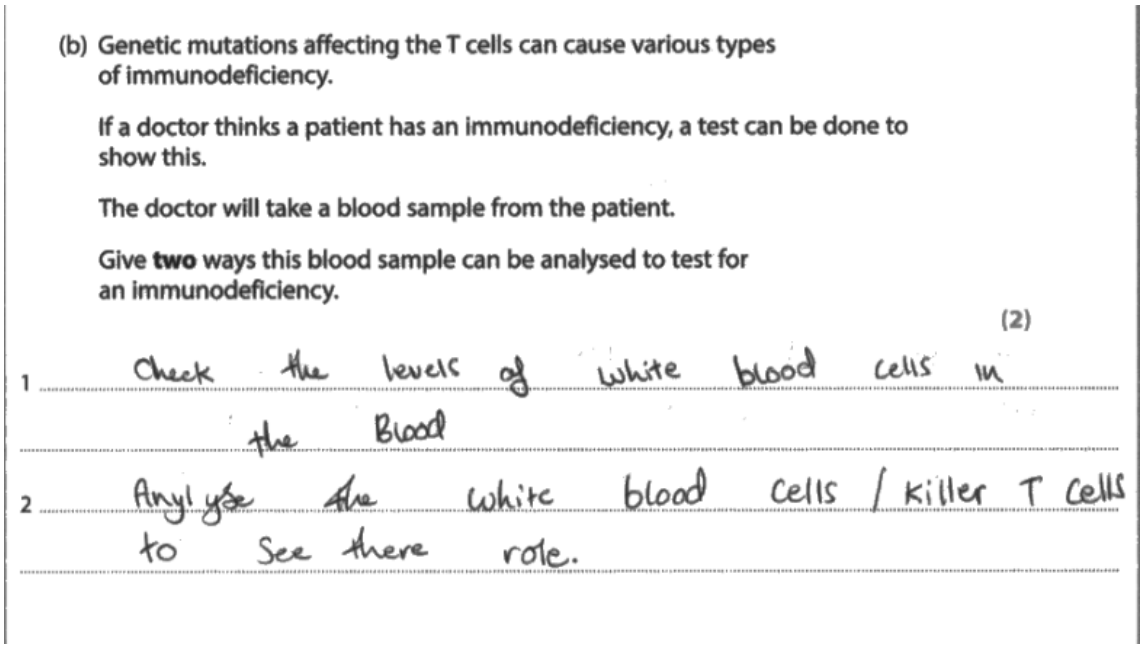
Here the learner has used simple but very straightforward language in their response. Because of this they have clearly been able to demonstrate their

understanding of the function of killer T cells and have achieved all three of the marking points for the question.

Question 8b

This question was generally well answered by learners with many awarded both marks. Some learners showed confusion between the different types of diagnostic blood tests with several responses describing mixing the blood with a sample of pathogen and watching for a response as would be done in ABO blood typing. The idea of genetic screening was also seen fairly regularly – where learners clarified that this was to identify a particular genetic immunodeficiency disease this could be credited but in most cases responses along these lines were too vague to be given marks.

In some cases, learners lost marks as they repeated the same marking point twice within their response. An example of an answer given 1 mark can be seen below:



(b) Genetic mutations affecting the T cells can cause various types of immunodeficiency.

If a doctor thinks a patient has an immunodeficiency, a test can be done to show this.

The doctor will take a blood sample from the patient.

Give **two** ways this blood sample can be analysed to test for an immunodeficiency.

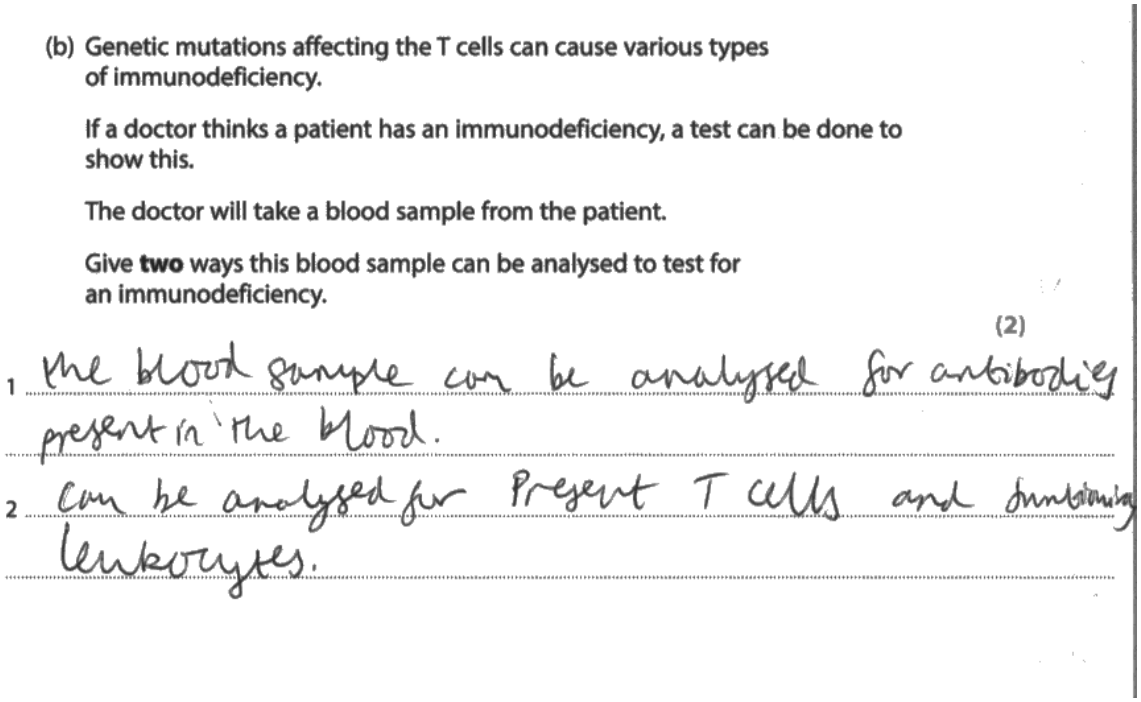
(2)

1 Check the levels of white blood cells in the Blood

2 Anyl yse the white blood cells / killer T cells to See there role.

Here the learner has given an appropriate description of a white blood cell count for the first marking point but has then repeated almost this same idea for the second method and so has only been given 1 mark.

An example of a learner response given 2 marks can be seen below:



(b) Genetic mutations affecting the T cells can cause various types of immunodeficiency.

If a doctor thinks a patient has an immunodeficiency, a test can be done to show this.

The doctor will take a blood sample from the patient.

Give **two** ways this blood sample can be analysed to test for an immunodeficiency.

(2)

1 the blood sample can be analysed for antibodies present in the blood.

2 can be analysed for present T cells and functioning lymphocytes.

The learner has given two correct methods of testing for an immunodeficiency using a blood sample and so is given both marks.

Question 8c

This question was well answered by many learners, with most responses using the information given within the question to inform the evaluation given. The best responses also brought in ideas from across the specification to support the judgements made.

An example of a learner response in Level 1 can be seen below:

(c) Severe combined immunodeficiency (SCID) is a disorder where the immune system does not function normally.

People with SCID are more likely to have pathogen infections.

A person diagnosed with SCID has been offered **two** alternative treatments.

Both treatments are available on the NHS.

Table 1 shows a summary of each treatment.

stem cell therapy	immunoglobulin replacement therapy
patient is given a bone marrow transplant containing immune system stem cells	patient is given an injection of a serum containing antibodies
if successful, the cells will continue to divide and differentiate to form a functioning immune system	treatment must be given regularly as antibodies are broken down as time passes

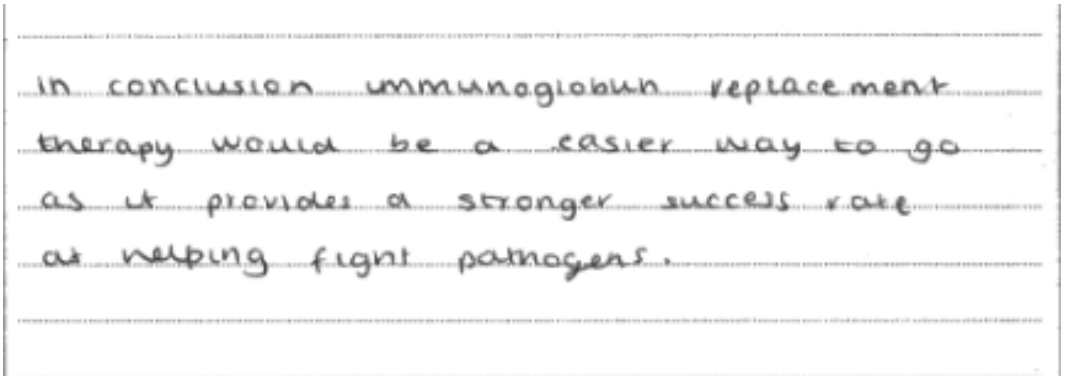
Table 1

Evaluate these **two** treatment options for a patient with SCID.

(9)

Stem cell therapy would be a one time treatment in order for the patient to be able to grow a healthy immune system however the treatment may not be 100% sucsess full as the body could reject the stem cells.

immunoglobulin replacement therapy would be a long-term therapy you would have to continuously have in order to keep a healthy immune system.


In conclusion immunoglobuin replacement
therapy would be a easier way to go
as it provides a stronger success rate
at helping fight pathogens.

Here the learner has summarised the information in the table – this alone would not be worth credit however, the learner has brought in an isolated piece of information about the possibility of rejection of stem cells to explain why the stem cell therapy may not work. They have also given a conclusion for their evaluation and attempted to justify this using information given in the question. This meets the criteria for an answer in Level 1.

Many learners were able to further develop their responses by bringing in their own knowledge of treatment processes. An example of a response given a mark in Level 2 can be seen below:

(c) Severe combined immunodeficiency (SCID) is a disorder where the immune system does not function normally.

People with SCID are more likely to have pathogen infections.

A person diagnosed with SCID has been offered **two** alternative treatments.

Both treatments are available on the NHS.

Table 1 shows a summary of each treatment.

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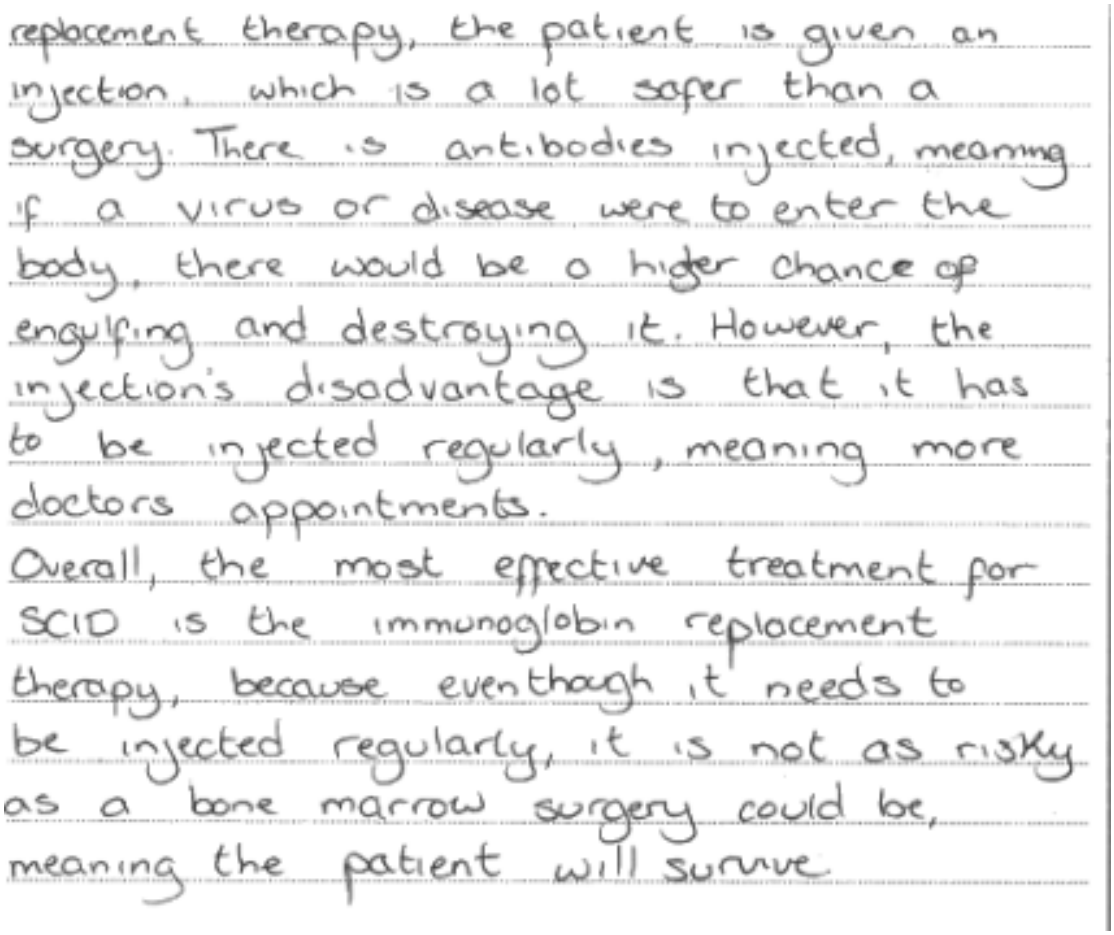
Table 1

Evaluate these **two** treatment options for a patient with SCID.

(9)

Stem cell therapy can be very effective as it can lead to the division and differentiation of cells which can help the immune system to function properly. This means that if the person were to catch a virus or disease, the immune system is stronger so can therefore fight it off. However, stem cell therapy has to be done with a bone marrow transplant, which is a form of surgery. No surgery has a 100% result in survival, so by having this surgery, it could put the patients life in danger.

On the other hand, immunoglobulin


replacement therapy, the patient is given an injection, which is a lot safer than a surgery. There is antibodies injected, meaning if a virus or disease were to enter the body, there would be a higer chance of engulfing and destroying it. However, the injection's disadvantage is that it has to be injected regularly, meaning more doctors appointments.
Overall, the most effective treatment for SCID is the immunoglobin replacement therapy, because eventhough it needs to be injected regularly, it is not as risky as a bone marrow surgery could be, meaning the patient will survive

This learner has most fully developed their evaluation mainly using ideas surrounding the effect on quality of life for the patient after each of the two different treatments. The response shows that the learner has an appreciation that different types of health intervention carry different levels of risk for the patient and has used this knowledge to support their evaluation. This response was given a mark in Level 2.

Where learners were awarded marks in Level 3 their responses showed they had considered their evaluation in terms of several different contexts. Responses in Level 3 tended to be more balanced in terms of considering advantages and disadvantages for both procedures and often used their knowledge of immunology to support this. Level 3 responses also showed an appreciation of the nuances in treatment decisions and learners given marks within this level often demonstrated that they understood there may be external factors affecting the choice of treatment rather than giving a definitive answer that one course was better than the other. An example of a Level 3 response can be seen below:

pluripotent ~~[illegible]~~

(c) Severe combined immunodeficiency (SCID) is a disorder where the immune system does not function normally.

People with SCID are more likely to have pathogen infections.

A person diagnosed with SCID has been offered **two** alternative treatments.

Both treatments are available on the NHS.

Table 1 shows a summary of each treatment.

rejecting - complications

stem cell therapy	immunoglobulin replacement therapy
patient is given a bone marrow transplant containing immune system stem cells	patient is given an injection of a serum containing antibodies
if successful, the cells will continue to divide and differentiate to form a functioning immune system	treatment must be given regularly as antibodies are broken down as time passes

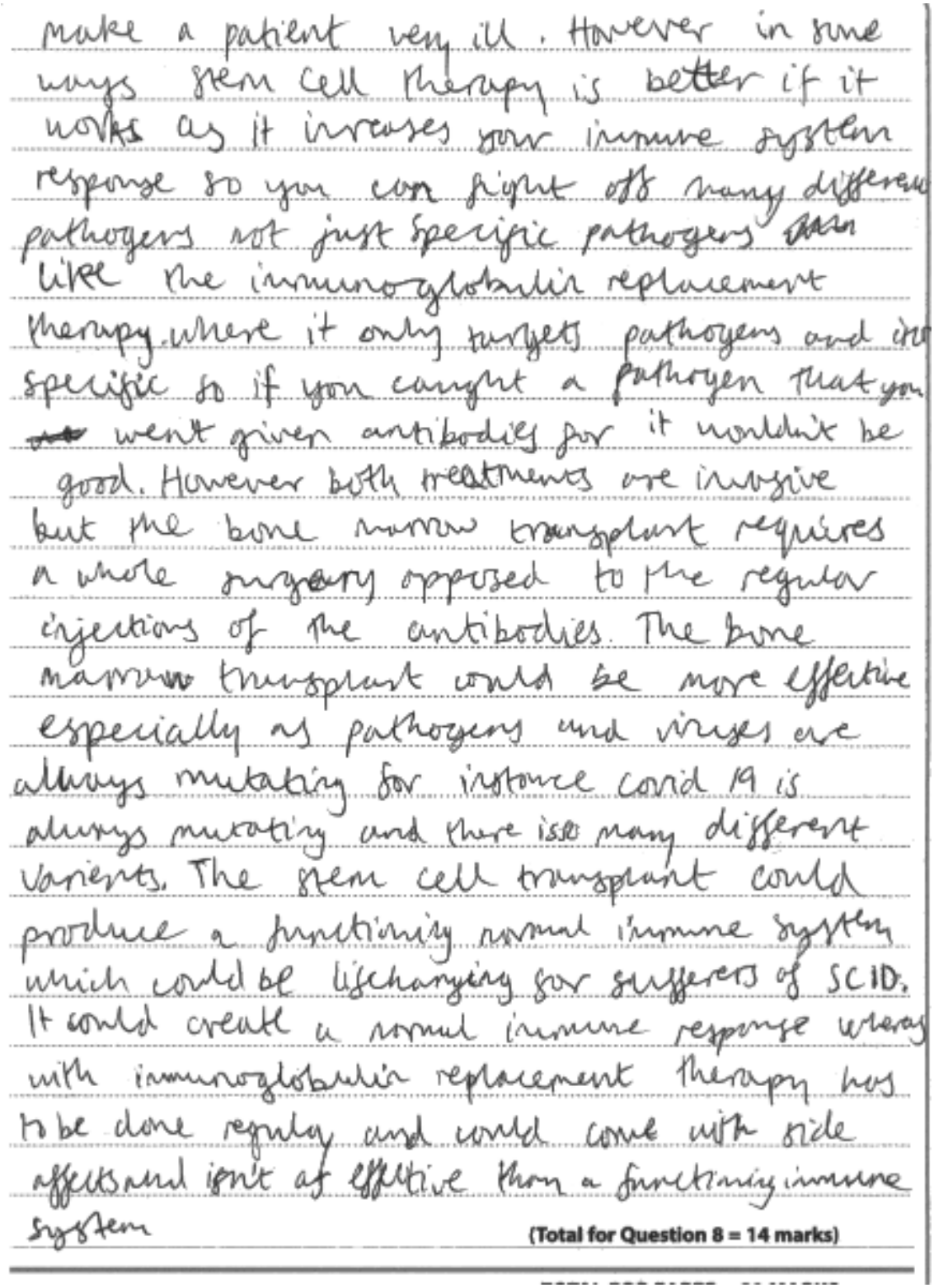
Table 1

Evaluate these **two** treatment options for a patient with SCID.

(9)

Stem cell therapy is a good way of providing immune system stem cells however it can be invasive and doesn't always work

immunoglobulin replacement therapy is a good way with providing antibodies ~~to~~ to help the patient with immune response. However the treatment must be given regularly ~~and~~ ~~[illegible]~~ however it is more successful than stem cell therapy as stem cell therapy needs to be successful for it to work and it it is not then the body may reject it and ~~[illegible]~~ rejection of transplants causes a lot of complications and can



make a patient very ill. However in some ways stem cell therapy is better if it works as it increases your immune system response so you can fight off many different pathogens not just specific pathogens like the immunoglobulin replacement therapy where it only targets pathogens and is specific so if you caught a pathogen that you went given antibodies for it wouldn't be good. However both treatments are invasive but the bone marrow transplant requires a whole surgery opposed to the regular injections of the antibodies. The bone marrow transplant could be more effective especially as pathogens and viruses are always mutating for instance covid 19 is always mutating and there isn't many different variants. The stem cell transplant could produce a functioning normal immune system which could be lifechanging for sufferers of SCID. It could create a normal immune response whereas with immunoglobulin replacement therapy has to be done regularly and could come with side affects and isn't as effective than a functioning immune system

(Total for Question 8 = 14 marks)

Here the learner has gone beyond the information provided in the stem and used their knowledge of biological processes to inform their evaluation. As well as considering the possibility of rejection and potential effects on quality of life, which were also seen in Level 2 responses, this learner has used also brought in ideas about specificity of antibodies. The learner uses their knowledge and understanding of the immune system and applies this to the specific context of

the question – in doing so they have provided a well-developed evaluation with a justified conclusion and have been given a mark in Level 3.

Summary

Based on their performance in this paper learners should:

- Make sure they avoid rephrasing of stem and/or stimulus material when answering a question. Responses using information provided in the question must include interpretation of the information or new pieces of knowledge to be worth any credit.
- Learn the normal biological processes with a focus on cause and effect. It is important to be able to demonstrate a clear line of reasoning in these cases to show an understanding of how one stage of a process leads to another
- Be clear on the purpose of each method of diagnostic testing covered in the specification. Learners should not just learn the methods of each diagnostic test but should also aim to have an appreciation of why each test is used for its particular purpose.
- Ensure that when answering exam questions responses are framed around the specific context given in the question – this will help to select which pieces of their knowledge are most relevant and should be included in their answer.
- Be careful when writing responses that their answers are not muddled by incorrect use of key terminology. Learners should aim for clarity of language first and foremost in their answers.

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